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DETROIT

A National Newspaper for Every Branch of the Industry

Automotive Daily News

CARS · SHOP EQUIPMENT · TRUCKS · AVIATION · PARTS · ACCESSORIES · TIRES

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REPLACEMENT BUYING AT NEW HIGH

S. A. E. DETONATION SYMPOSIUM DRAWS WIDESPREAD INTEREST

By CHRIS SINSABAUGH

DETROIT, Jan. 22.—The annual meeting of the Society of Automotive Engineers started its fourth day this morning. The thousand or more delegates have gone a fast pace so far, but there is no sign of a slowing down in enthusiasm. All sessions have been well attended and there has been more discussions following the reading of the papers than usual. It is most evident that this is one of the best meetings ever held by the S. A. E.

It was a comparatively short program that faced the engineers because of the annual banquet this evening, with the Detroit section acting as host to the national body. Every seat in the big banquet hall was sold. Phil Kent, the Detroit section's crack toastmaster, officiated again, with James Schermerhorn, another local boy, who has made good, acting as master of ceremonies.

Talks were given by Mayor Frank Murphy of Detroit, and the new president of the S. A. E., Vincent Bendix. The sensation of the evening was Larry A. Hawkins of the General Electric Company, the electrical wizard, whose theme was "Gulliver's Travels Among the Real Lilliputians of the Universe."

There were two sessions today, the morning being given over to the aircraft engine session, with C. L. Lawrence in the chair. "Fuel Injection With Spark Ignition in an Otto Cycle Engine," by G. L. Williams, E. S. Taylor and C. Fayette Taylor of the Massachusetts Institute of Technology, and "Increasing the Thrust, Horse Power of Radial Air-Cooled Engines," by P. B. Wright of the Wright Aeronautical Corporation, were the papers read and discussed.

In the afternoon came the Diesel engine session, with O. D. Treiber in the chair, and with E. F. Ruehl of

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AUTOMOTIVE SALES CONTINUE TO LEAD 1930 RETAIL CENSUS

Special from A. D. N. Washington Bureau

Washington, Jan. 22.—Automotive groups continue their lead in the 1930 census of retail distribution on the basis of reports from five additional cities released today by the Bureau of Census of the Department of Commerce. These figures are based on the retail sales reports covering activities during 1929.

The cities reported today include Salt Lake City, Utah; Sacramento, Cal.; Pasadena, Cal.; Klamath Falls, Ore.; Portland, Ore., and Alameda, Cal. In each of these cities, with the exception of Portland, Ore., and Alameda, Cal., the automotive retail sales during 1929 led by a good margin. In the two latter named cities the retail sales of automotive products were exceeded only by retail sales of food stuffs.

Retail business in Salt Lake City of approximately $93,000,000 is shown by the Bureau of the Census in the release today of the returns from the 1930 distribution census

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BURKHOLDER HEADS MICHIGAN DEALERS

Detroit, Jan. 22.—The annual meeting of the Michigan Automotive Trade Association, held here Wednesday, elected A. B. Burkholder of Grand Rapids, president for the ensuing year. He succeeds Harold J. Allington of Saginaw. Mr. Burkholder was stepped up from vice-president.

The new vice-president is Albert C. Benter of Pontiac. H. H. Shuart of Detroit was retained as secretary and Treasurer John W. Neumann of Detroit also was re-elected.

District directors, chosen by Congressional districts, were: Frank B. Brophy of Kalamazoo, Fred W. Kramer of Grand Rapids, Guy S. Garber of Saginaw, William De Vette of Muskegon and William Dunlop of Bay City.

Directors at large elected were Sewell Platt, Ann Arbor; V. H. Parker, Adrian; Jerry De Noyer, Battle Creek; Frank W. Hathaway, Muskegon. Directors whose terms

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CONNECTICUT TRUCK ASSOCIATION ELECTS E. J. ARBOUR PRESIDENT

New Britain, Conn., Jan. 22.—Everett J. Arbour of New Britain, head of the Consolidated Motor Lines of this city, was re-elected president of the Motor Truck Association of Connecticut, Inc., at the annual meeting of the association held at the Bond Hotel in Hartford.

The following list of officers were unanimously elected:—

President, Everett J. Arbour of New Britain; vice-president, Leonard S. Clark of Greenwich; treasurer, Stephen L. Smith of Meriden, and directors, Harold C. Davis of Hartford, Joseph Brazos of Middletown, H. A. Sillence of Hartford, M. J. Bisnovich of Waterbury, B. C. Edgerton of Bridgeport, J. G. McFarland of New Haven, W. A. Perrett of South Manchester, L. A. Johns of Meriden and Thomas Plunkett of New Haven.

President Arbour presided at the business meeting. In his annual report he spoke in opposition to fixing rates charged for transportation, stating that any such attempt would be in direct violation of the law. He recommended the formation of various divisions within the association, such as the interstate operators' group, dump truck operators' division, a group composed of owners of trucks who operate them in their personal business and not for hire, a group composed of truck operators who do only a local business.

REACHES 2,815,000 IN 1930; 'NEW BUYERS' DROP SHARPLY

Turning In of Old Cars, However, Failed to Reach Normal and Big Delayed Demand Was Carried Over Into Current Year

NEW YORK, Jan. 22.—Replacement buying of new passenger and commercial cars in the United States in 1930 set up a new high mark, although the margin was slight. According to estimates based on the most reliable statistics available at this time, replacement demand reached 2,815,000, as compared with 2,800,000 in the preceding year, the previous record, a gain of ½ of 1 per cent.

On the other hand, the purchasing of new motor vehicles, by "new and multiple car buyers" dropped to the lowest point in the past fifteen years, amounting to approximately 219,000, as against 1,608,000 in the preceding year, a falling off of 86 per cent. Included among the buyers in this classification are those who purchase new cars for the first time without turning in old cars, or motorists who add an additional car to those already owned.

In other words, 92.7 per cent. of all the new motor vehicles sold in the United States last year went into the replacement market, leaving only 7.3 per cent. for the new buyers. This compared with 63.5 per cent. of the total going into the replacement market in 1929 and 36.5 per cent. being accounted for by the so-called new buyers.

It is thus evident that the chief factor in the 33 per cent. decline in sales last year was the great shrinkage in the number of persons making their first venture as new automobile owners or adding a second or third car to vehicles already owned.

It is estimated that the normal demand last year from these new buyers would have been 1,750,000. This means that more than 1,500,000 persons, who, under normal conditions, would have entered the au-

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U. S. RUBBER TO BOOST OUTPUT IN NEWLY ACQUIRED PLANTS

Detroit, Jan. 22.—With acquisition of a controlling interest in Samson Tire and Rubber Company, Los Angeles, and the Gillette Rubber Company of Eau Claire, Wis., the United States Rubber Company has completed a far-reaching program of expansion, according to announcement here by J. F. O'Shaughnessy, manager of the company's tire department.

Under this plan United States tires will be manufactured at three plants, which will be operated under the general direction of the company's tire department at Detroit.

Tires for distribution along the Pacific Coast and the Far Western section of the United States will be manufactured at the Samson plant in Los Angeles, while distribution in the Northwestern section will be handled by the Gillette plant in Eau Claire.

Production in all three plants will be stepped up at once, it was stated

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Rails Grant Lower Rates On Shipments of Batteries

NEW YORK, Jan. 22.—Following a hearing before the Eastern Trunk Line Association here today, supplementing a similar presentation before Central lines at Chicago, the railroads have granted a new reduced freight rate of fifth class, 30,000 pounds minimum, on batteries shipped to North Atlantic ports for export.

Heretofore batteries have been charged fourth class rates; or if shipped at fifth class a minimum of 50,000 pounds per carload was exacted, which made the rate ineffective in export trade which cannot ordinarily take such large quantities in single shipments.

The industry was represented at today's hearing by W. J. Bailey, Electric Auto-Lite Company; M. M. Twohig, Willard Storage Battery Corporation; A. C. Wilkes, Overseas Motor Service Corporation of General Motors, and J. S. Marvin, National Automobile Chamber of Commerce.

The new rating is expected to aid the American battery manufacturers materially in retaining a larger proportion of the battery business against foreign competition.

TIRE SHIPMENTS GAIN 17% DURING DECEMBER OVER PREVIOUS MONTH

New York, Jan. 22.—Tire shipments for December increased 17 per cent. above November and were 3 per cent. above December a year ago, according to a special preliminary report compiled by the Rubber Manufacturers' Association.

This increase is counter to the decreases usually experienced in December, as compared with November. In 1929 the decrease was 3 per cent.; in 1928, 8 per cent., and in 1927, 3 per cent.

This increase is attributed by officials in the rubber industry to improvement in car production and replacement requirements for all classes of motor vehicles.

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Detroit Show Enthusiasm Mounts; Sales Exceed 1930

CRUDE OIL PRODUCTION INCREASES; IMPORTS OFF

New York, Jan. 22.—The American Petroleum Instiute estimates that the daily average gross crude oil production in the United States for the week ended January 17, 1931, was 2,094,000 barrels, as compared with 2,084,900 barrels for the preceding week, an increase of 9,100 barrels. The daily average production east of California was 1,551,600 barrels, as compared with 1,546,400 barrels, an increase of 5,200 barrels.

Imports of petroleum (crude and refined oils) at the principal United States ports for the week ended January 17, totaled 1,719,000 barrels, a daily average of 245,571 barrels, compared with 1,891,000 barrels, a daily average of 270,143 barrels for the week ended January 10, and a daily average of 270,250 barrels for the four weeks ended January 17.

DETROIT, Jan. 22.—**Enthusiasm over the Detroit show continues to mount. It is announced that on the first day 154 cars were delivered to new owners, as compared with 132 a year ago.**

Indications point to this average being maintained during the week. Two more of the big companies cut in today with dealer gatherings.

Oakland-Pontiac brought in more than 400 for its annual sales presentation and convention at the Statler. A banquet will be held this evening, with all the company's leading executives and several of the General Motors chiefs in attendance.

Nash dealers came to town to attend a noon meeting at which C. W. Nash will be the main speaker, flanked by E. H. McCarty, vice-president, and C. H. Bliss, general sales manager. The affair is being handled by the local distributors, the Miller-Judd Company.

AUTOMOTIVE SALES CONTINUE TO LEAD 1930 RETAIL CENSUS

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now being compiled. The 1930 population of Salt Lake City is 140,184.

The automotive group takes the lead in the report, with the general merchandise group second and the food group third in order of sales. These three groups do over half the retail business in this city.

The automotive group, with 259 establishments, reports sales of $19,434,687, or 21 per cent. of the total retail business. Motor-vehicle sales, including sales of new and used cars, amount to $14,862,539 and sales through thirty-five accessory, tire and battery stores are $1,315,477. A total of 120 filling stations is reported with aggregate sales of $2,333,175 in gas, oil, tires and other accessories. Of these, sixty-five stations doing a business of $1,133,041 are single-store independents. The volume of business of $811,755 reported by sixty-eight garages, includes receipts from sales of gas, oil and accessories as well as receipts for service and repairs.

Retail business in Sacramento in excess of $73,000,000 is shown. The 1930 population of Sacramento is 93,685.

The automotive group takes the lead in this report, with the food group second and the general merchandise group third in order of sales.

The automotive group, with 280 establishments, reports sales of $15,484,517, or 21 per cent. of the total retail business. Sales in motor vehicle establishments amount to $9,418,825 and sales through thirty-four accessory, tire and battery stores are $1,928,190. A total of 117 filling stations reported, with aggregate sales of $2,362,454 in gas, oil, tires and other accessories. This merchandise is also sold in ninety-two garages, which report a business of $1,421,119, including in the amount receipts from repairs and storage as well as from sales. Of the 117 filling stations, eighty-three single store independents have sales of $1,770,339, while sixteen local multi-units and eighteen units of sectional and national chains report a business of $592,115.

Retail business in Pasadena of approximately $60,000,000 is reported. The population of Pasadena is 75,875.

The automotive group takes the lead in this report, with the food group second and the apparel group third in order of sales.

The automotive group, with 308 establishments, reports sales of $16,004,856, or 27 per cent. of the total retail business. Sales in motor vehicle establishments amount to $10,196,901 and sales through forty-two accessory, tire and battery stores are $1,515,034. A total of 132 filling stations is reported with aggregate sales of $2,726,169 in gas, oil, tires and other accessories. This merchandise is sold also in garages, which report a business of $1,320,531, including sales and receipts from repairs and storage. Of the 132 filling stations, thirty-six are operated by local, sectional and national chains and do a business of $843,362 and ninety-six single store independents report sales of $1,882,807.

Retail business in Klamath Falls was in excess of $14,600,000. The 1930 population of Klamath Falls is 16,053.

The automotive group takes the lead in this report, with the food group second, and the general merchandise group third in order of sales.

The automotive group, with fifty-nine establishments, reports sales of $3,926,736, or 27 per cent. of the total retail business. Sales in motor-vehicle establishments amount to $3,000,702 and sales through accessory, tire and battery stores are $194,540. A total of thirty filling stations is reported with aggregate sales of $623,959 in gas, oil, tires and other accessories. Sales of this merchandise and receipts from repairs and storage are included in the total business of $107,535 reported by garages. The motor-vehicle sales appear unusually high due to the existence in Klamath Falls of automobile retailers who are also large distributors.

Retail business in Portland was in excess of $211,000,000. The 1930 population of Portland is 301,890.

The automotive group, with 816 establishments, reports sales of $41,012,922, or 19 per cent. of the total retail business. Sales in 54 motor-vehicle establishments amounted to $25,368,982, and sales through 89 accessory, tire, and battery stores are $3,968,348. A total of 333 filling stations is reported with aggregate sales of $6,158,389 in gas, oil, tires, and other accessories. This merchandise is also sold in 304 garages which report sales and receipts from repair and storage amounting to $4,571,691. Of the 333 filling stations 267 are single-station independents, 15 are local multi-units, and 51 are sectional and national chains.

Retail business in Alameda, Cal., was approximately $9,500,000. The 1930 population of Alameda is 34,367.

The automotive group, with 59 establishments, reports sales of $2,514,069, or more than 26 per cent of the total retail business. Motor-vehicle sales of 11 stores amount to $1,728,677, and sales through 7 accessory tire and battery stores are $134,856. A total of 20 filling stations is reported with sales of $470,361 in gas, oil, tires, accessories, and other merchandise. The volume of business of $150,944 reported by 17 garages includes receipts from sales of gas, oil and accessories as well as receipts for service and repairs.

BURKHOLDER HEADS MICHIGAN DEALERS

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did not expire were Walter J. Bemb, Detroit; Fred C. Pinkham, Jackson; John Hinga, St. Joseph; Albert C. Benter, Pontiac; Albert B. Parfet, Port Huron; Bruce R. Dodds, Detroit. Directors at large whose terms did not expire were Robert H. Alber, Ann Arbor; D. D. Harris, Lansing; Harry May, Monroe; C. R. Dickerson, Mount Clemens; Joseph H. Thompson, Hillsdale.

Among the resolutions adopted was one commending the National Automobile Chamber of Commerce for its action in recommending a one-time announcement of new models in November and December. However, the Michiganders favored December and January for these models announcements instead of November and December.

They cited the advantages that would accrue to the dealers in eliminating evils like interfering with sales in the midst of the selling season; frequent changes in models as a result of fluctuating trade in prices and sales at cut prices. They said the bankers and finance companies of Michigan favor December and January announcements.

Another resolution indorsed the "Care Will Save Your Car" campaign of the Motor and Equipment association, which, the association thinks, will improve car performance, produce more satisfied owners and at the same time increase the service income of the dealer and provide sales opportunity through more frequent owner contacts.

The day was given over to inspirational talks by such authorities as C. A. Vane, secretary and general manager of the National Automobile Dealers' Association; Herbert Buckman, manager of the Cleveland Automobile Manufacturers' Association, who told of the national junking campaign; Milan V. Ayres, the economic analyist of Chicago; H. Wallace Peters, Packard vice-president in charge of sales, and H. E. McConnell, chief of the title division of the Michigan Department of State.

Manager W. E. Edenburn put on a mighty fine show, winding up a triumphal day with a banquet in the evening, attended by 500 dealers, at which the guest of honor was Gov. Wilber Burkcer of Michigan.

BURRUSS TO ADDRESS SYRACUSE, N. Y., DEALERS

Syracuse, N. Y., Jan. 22.—William B. Burruss of the National Automobile Dealers' Association will be the principal speaker at the annual meeting and banquet of the Syracuse Automobile Dealers' Association, to be held in the Hotel Syracuse the evening of January 29. His subject will be "Start Where You Are."

U. S. RUBBER TO BOOST OUTPUT IN NEWLY ACQUIRED PLANTS

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by Mr. O'Shaughnessy. Within two months, he said, the Detroit plant will be operating at full capacity and the present force of 3,500 workers increased. At the Eau Claire plant some 12,000 casings are now being produced daily and about 1,200 workers employed. Production here will be increased, as well as the working force, it was stated by Mr. O'Shaughnessy. At the Samson plant, in Los Angeles, a production schedule of 6,000 casings and 10,000 tubes daily has been maintained, but this is being increased, and will be doubled before the end of the year, Mr. O'Shaughnessy said.

With the acquisition of a controlling interest in the Gillette Rubber Company the following officials of the United States Rubber Company have been added to the directorate of the Gillette company: F. B. Davis, Jr., president of the United States Rubber Company; L. D. Tompkins, vice-president, and William De Kraft, chairman of the finance committee, all of New York. R. B. Gillette, Eau Claire, has been retained as chairman of the board. The Samson name will be continued in Los Angeles as the Samson Tire and Rubber Corporation Division of the United States, with F. B. Davis as chairman of the boards of directors. Other directors are: A. Schleicher, president and general manager; B. F. Schleicher, vice-president; Herbert E. Smith, J. B. Brady, E. S. Willima, secretary, and H. L. Howard, controller.

Machinery for the Los Angeles plant is being rushed there for installation under direction of F. D. Carpenter, who has been factory manager at Detroit, and who will remain in Los Angeles in charge of manufacturing operation. J. B. Magee, for years prominent in the industry in the West as Pacific Coast manager of the tire department of the United States Rubber Company, has been made general sales manager for the Samson company. Personnel at the Eau Claire plant will remain unchanged, it was stated by Mr. O'Shaughnessy, who plans to pay a visit of inspection, with other officials of the company, in the near future.

200 DEALERS GATHER FOR OLDSMOBILE PREVIEW

Toronto, Ont., Jan. 22 (UTPS).—Two hundred dealers, salesmen and service managers from the Oshawa zone of General Motors of Canada, Ltd., gathering at Oshawa for a preview of the new Oldsmobile, on exhibition in the General Motors auditorium, were optimistic in regard to the business prospects for this year.

In commenting on the gathering, F. C. Barker, sales promotion manager for the Oshawa zone, said:

"It clearly shows the interest being taken in the new model this year. Among the new dealers we have lined up are some of the best in the country. While other automobile companies have been tightening up on their sales policy, General Motors has adopted a policy of expanding its sales forces, and we have been signing up a large corps of additional dealers. We are thus ready to take advantage of every improvement in business, and we expect that 1931 will see a marked increase over last year."

OMAHA FORD PLANT EXPECTS BUSY YEAR

Omaha, Neb., Jan. 22.—Commenting on business prospects for 1931, G. A. Liles, who came here recently to manage the local Ford assembly plant, anticipates a big year in Ford passenger car and truck sales. Liles has been connected with the Ford Motor Company since 1919, his first assignment being manager of the branch at Louisville, Ky. In his eleven years with Ford, he has managed several other branch houses in the East, and until coming to Omaha was at the factory in Detroit doing production and sales work.

SPARKS *from* DETROIT

Christie's Contributions

* * *

Engines in the Rear

* * *

Cars of the Future

* * *

Chris Sinsabaugh—Detroit Editor

BETWEEN sessions of the Society of Automotive Engineers' annual meeting this column conductor dropped in at the Paramount. A Hearst news reel was on. The first picture showed the demonstration in New Jersey of the new war tank, caterpillar-treaded, when it operated over the open country. Put on wheels, it did seventy miles an hour with ease. The inventor, apparently well into the 60's in the point of age, addressed his unseen audience, telling about the tanks. It was W. J. Christie.

Christie, Christie? I thought; that sounds familiar. And then I identified him. It was Walter Christie. We didn't know him as W. J. in the days when he brought out the Christie front-drive, which is generally credited with being the first of that type ever built. E. L. Cord certainly should be appreciative of the inventive genius of this aged New Jersey engineer.

* * *

CHRISTIE startled the automobile world in 1903 when he appeared at the beach meet at Daytona, Fla., with his giant freak. The car undoubtedly was fast—faster than anything on the beach—but it was a quarter horse. George Robertson tried it out, but found it could not maintain its terrific speed more than a quarter or a half mile, the main trouble being caused by inadequate cooling. There was no radiator, cooling being effected through a water tank in the rear, just as in the case of a locomotive. They even tried ice to cure the fault. When the motor overheated (and that was almost a chronic condition) the speed trial was through.

Inventor Christie, though, had the courage of his convictions, and he put the car in one of the early Vanderbilts, but it was the same old story. For years the old boat was kicked from pillar to post, until Barney Oldfield got hold of it. Barney was the only one who seemed to be able to handle the brute, but even he couldn't do anything more than use it for short speed trials. Probably the greatest feat of the Christie was to encircle the Indianapolis Speedway, piloted by Oldfield, in 1.27, equal to 102 miles per hour, the first time the classic oval was negotiated at better than 100 miles per hour.

Oldfield convinced Harry Miller, the famous California engineer, of the possibilities of the front-drive, and the latter built, for Jimmy Murphy, a car of that type, which started the trend to the front-drive.

* * *

THROUGH this column last month, A. J. Baker, chief engineer of Willys-Overland, aired his views concerning the possibilities of the industry swinging to the engine in the rear principle in the not far distant future. That sounded most interesting at the time, but it was not until this week at the annual meeting of the Society of Automotive Engineers that I realized how widespread was this belief among the men responsible for motor car trends.

This became most apparent at the body engineers' session and Capt. H. Ledyard Towle, art director of the Campbell-Ewald advertising agency, is responsible for bringing this into the limelight. The captain was addressing the engineers on color and body design, being unquestionably qualified for this, on his past record. He declared that the engineers should not worry so much about the present as the future, and he advised them to look ten years ahead and try to forecast the car of that day. Then he aired his own views as to that car. As he saw it, it will be of the "tear-drop" body type, with the "bulge" in front, tapering off into a tail which will contain the engine, a true aerodynamic design, as exemplified in the typical airplane wing. He likened it to the modern ocean greyhound, the Bremen, with the bulge in front.

* * *

TO the surprise of the audience, perhaps, Capt. Towle's views were approved by several prominent engineering minds, including the chairman of the meeting, L. Clayton Hill, president of Dietrich, Inc.; Herbert Chase of McGraw-Hill, and David Beecroft of Bendix, all advanced thinkers. The gist of the discussion was that, with the engine in the rear, streamlining could be improved, there would be greater visibility of the road immediately ahead, more room for baggage would be provided and the car would be faster because of the "bulge" construction. Chase even went so far as to suggest that the engine could be located transversely in the rear to great advantage.

Declares 1930 Conditions Demanded Good Merchandising

W.T. Young, Jr., General Sales Manager For Peerless, Describes Methods That Kept Sales Normal

CLEVELAND, Jan. 22.—Unusual conditions such as those experienced by the automobile industry during the year just past call for thoughtful merchandising methods and intensive advertising, according to William T. Young, Jr., general sales director of the Peerless Motor Car Corporation.

"We've been up against a situation that's just like driving a car up a long, steep grade," says Young. "And there's just one thing to do: that's to shift gears and step on the gas as hard as possible.

"At Peerless headquarters we decided that only extraordinary methods would move cars in quantity under present conditions. We increased our advertising appropriation and used full page advertisements in the newspapers to tell our story to the public. We redecorated our show rooms and inaugurated a rather extensive merchandising campaign.

"Even in urban districts, prospects are too scattered for individual selling effort. An appeal which will bring large numbers of persons into the show room is a sure way of obtaining a live prospect list. Our salesmen say they must talk to a hundred people to sell eight cars.

"We found that this sort of coordinated sales effort paid. Prospects actually crowded our show rooms at all points where we used these intensive methods. In one of our most important territories our new car sales spurted from fifteenth place in October to fourth place in November, and held this same place in December.

"And what is more important, we have proved, to our satisfaction at least, that the present economic conditions facing the automobile industry are not due entirely to the lack of potential buyers. One of our greatest difficulties has been the fact that the industry has had such easy going for the past few years that we had forgotten how to sell. Sales managers had turned into liaison agents between factory production departments and the distributing organization in the field.

"We had been spinning along so swiftly and so smoothly in high that we'd almost forgotten that there were hills which could tax our power and compel us to shift gears.

"While our tactics at the Peerless plant proved definitely that there are car buyers, I do not mean to say that buying is being done on a normal basis.

"In 1931 the demand, above everything else, is for value. The manufacturer who gives the greatest value of which he is capable, who sells hard and who advertises consistently to impress this value on the public mind, is the one who can look forward to a balance sheet a year hence which will be highly satisfactory."

CLEVELAND DE SOTO GROUP HEARS DR. PAUL W. IVEY

Cleveland, Jan. 22.—Dr. Paul W. Ivey, sales counselor in the University of Southern California, was one of the chief speakers before De Soto automobile dealers of the Cleveland zone at their annual convention, which has just closed here. Dealers came from all over the zone, extending through northeastern and central Ohio and parts of Pennsylvania, West Virginia and Maryland. Other speakers were L. G. Peed, general sales manager of the De Soto Motor Corporation, and Harry G. Moock, director of the Central Used Car department of Chrysler Motors. John R. Berry is Cleveland district manager.

LEGION BACKS SHOW

Marshalltown, Ia., Jan. 22.—The local post of the American Legion is to act as sponsor of the Central Iowa Automobile Show, February 18, 19 and 20.

Ads Feature Old Customer Satisfaction

Buick
OPPOSITE P. R. R. FERRY—CAMDEN
Satisfaction—And When We Say Satisfaction,
We mean just that in every sense of the word. They satisfy in appearance and performance as well as in price and terms. Be FAIR to yourself—don't fail to see these wonderful cars; when customers return to a business firm to buy you can be sure the firm gives satisfaction. That's why we are proud of the large number of cars we sell at all times to old customers.
1929 Buick Coupe ..$900
Five-passenger, reconditioned and refinished.
1926 Buick Sedan ..$325
Four-door, refinished reconditioned, 4 new tires.
1927 Buick Coupe ..$395
Five-passenger. In the very best of condition.
1929 Buick Coupe ..$695
Refinished and reconditioned
1926 Buick Coupe ..$200
Standard 6, beautiful condition.
1930 Buick Coupe ..$950
Country Club model, like new
1928 Buick Victoria, $525
Four-passenger, refinished, good rubber.
1927 Buick Sport Roadster $400
Master 6, perfect car
1927 Buick Sedan ..$375
Standard 6, 2-door, refinished and reconditioned.
1925 Buick Coach ..$200
Master 6, in excellent condition.
1930 Buick Sedan, $1200
Seven-passenger, looks like new.
1929 Buick Sport Roadster $695
Equipped with 6 tires, a snappy model.
1927 Buick Sedan ..$375
Master 6 2-doo
1930 Marquette Sport Roadster $750
Six wire wheels fender wells, cat like new.
1929 Pontiac Sedan .$395
Four-door, looks like new.
1928 Studebaker Commander $425
Four-door sedan.
1925 Studebaker Phaeton $100
Duplex model A-1 condition.
1927 Peerless Sedan, $350
Model 80, reconditioned and refinished
1928 Essex Coach ..$165
Good running condition.
1928 Willys-Knight Sedan $475
Model 70-A 4-door, refinished, low mileage.
1927 Pontiac Sedan, $225
Landau model, good motor.
1928 Chrysler Sedan $475
Model 72, excellent condition.
1929 Graham-Paige Coupe $375
Five brand new tires.
1929 Nash Sedan ..$425
Standard 6, low mileage like new.
1926 Essex Coach $75
A wonderful buy.
1929 Chrysler Sedan, $525
Model 65, reconditioned and refinished.
1929 Viking Sedan ..$800
Four-door, like new.
1929 Nash Victoria, $675
Four-passenger, beautiful condition.
1928 Graham-Paige Sedan $495
Model 619, run 12,000 miles.
1926 Nash Sedan ..$275
Seven-passenger, excellent condition
928 Chevrolet Coach $235
Very good condition.
NEW JERSEY AUTO and SUPPLY COMPANY
BUICK DISTRIBUTORS
Delaware Avenue and George Street, Camden
Phone—Camden 2327

THE NEW JERSEY AUTO AND SUPPLY COMPANY, Buick distributor, Camden, N. J., has found the above method of advertising satisfactory. The firm features the fact that it sells a large number of its cars to old customers. In the listing, the year, model and price stand out. A few words of explanation accompany each listing

FORD AND CHEVROLET DEALERS OPTIMISTIC IN WARREN, PA., DISTRICT

Warren, Pa., Jan. 22.—Revival of industrial operations in Warren county and vicinity since the turn of the year has already reflected on the business of Ford and Chevrolet dealers in the district, most of whom report wide improvement in sales of both new and used cars and business at the service stations. The situation is expected to further improve from week to week throughout the first half of the year and most factors in the trade look forward to a spring and summer business of highly satisfactory proportions.

The Elliott Chevrolet Company, 409 Pennsylvania Ave., Warren, reports that new orders and inquiries for new cars since the holidays have been in larger volume than was expected. Used cars are at a minimum and the firm has concentrated its efforts during the past few months on disposition of used cars. One of the most satisfactory sales plans has been the offering of used cars on a six-day guarantee basis.

Service station business has improved about 15 per cent. since January 1 at the Rossell Garage, Pennsylvania Avenue, Ford dealership. Used car stocks are at the lowest point in many months and a general revival in sales of new cars is looked for during the early spring and summer months.

In Youngsville, Pa., the Matson Chevrolet Company reports a good demand for light delivery cars. New vehicles are beginning to move in greater volume off the sales floor, according to George T. Matson, proprietor, who looks forward to an excellent volume of business this year. Inquiries to hand at this time are more numerous than a year ago.

The City Garage, Sheffield, Pa., Ford dealership, views the outlook with optimism.

PLAN $20,000 SHOW ROOM

Santa Monica, Cal., Jan. 22.—Plans have been completed for the erection of a $20,000 building at 20th Street and Wilshire Boulevard for J. H. Wray, Ford dealer. The structure will be 102 by 150 feet, one-story, of modernistic design.

YOUNGSTOWN DEALERS ELECT BROCKETT HEAD; NAME SHOW CHAIRMAN

Youngstown, O., Jan. 22.—L. B. Brockett is the newly elected president of the Youngstown Automobile Dealers Association. E. D. Hopper was elected first vice-president; Walter Schaff, second vice-president, and J. S. Taylor, L. F. Donnell and H. F. Black, trustees.

Hopper, A. G. McGuire and Donnell were chosen to serve on the association's avdertising committee during 1931. W. O. Strausbaugh, chairman, and A. H. Moore compose the membership committee, and McGuire and Hopper, with C. T. Gaither as chairman, form the budget and finance committee.

The association's grievance committee for the coming year includes Walter Schaff, chairman, James A. Henderson, J. S. Taylor and H. F. Black, while J. S. Taylor is chairman of the legislation and better business committee, with F. B. Smith, J. A. Henderson, A. H. Moore and H. R. Hooper as other members. D. A. Heindl is chairman of the sports and entertainment committee, with Moore and Taylor as other members.

W. O. Strausbaugh is chairman of the committee directing the Youngstown automobile show, with Heindl as assistant.

PROPOSE NEW MOTOR CODE FOR GEORGIA

Atlanta, Ga., Jan. 22 (UTPS).—A new motor vehicle act, to be known as the "Motor Carrier Act of 1931," has just been introduced in the Georgia Legislature by Senator Myrick.

The measure, which was introduced to strengthen the present control of the Georgia Public Service Commission over bus lines in the state, and which will, if passed, supersede the motor vehicle act of 1929, is much more definite in its instructions to the commission.

NAMED CHEVROLET DEALER

Los Angeles, Jan. 22.—Domenick Basso, 1201 North Broadway, has been appointed a city Chevrolet dealer. He has been a new car dealer since 1916 and in his present location since 1924.

D. N. VANDERHOEF HEADS FORD'S TWIN CITY PLANT

Minneapolis, Minn., Jan. 22.—Announcement of the appointment of D. N. Vanderhoef as assistant manager of the Ford Motor Company's Twin City plant has just been made. Mr. Vanderhoef has served in official capacities at the company's headquarters in Dearborn, Mich., for more than ten years.

Previously head of the Ford tractor department and later of the service division at Dearborn, Mr. Vanderhoef recently traveled the entire United States as special representative from the Ford general headquarters. He has served in direct contact between the dealers and the Twin City branch, which takes in the entire Northwestern territory, in his new duties. Mr. Vanderhoef has already assumed his new position, A. W. Bendick, manager of the plant, announced.

GARVIN CHEVROLET CO. NAMES FLEMING MANAGER

Rochester, N. Y., Jan. 22.—Burr A. Judd, former manager of the Webaco Oil Company, and Howard G. Fleming, for sixteen years associated with the automobile industry in western New York, have been appointed general manager and sales and service manager, respectively, of the Garvin Chevrolet Corporation, West Side dealer.

Judd, besides directing the company's policies, also will have charge of its financial affairs. Fleming served ten years with Chevrolet as salesman and for two years was sales manager of the Burch Chevrolet Corporation here. He also has been with Paige and Buick as a salesman.

NEW CHEVROLET CONCERN

Toronto, Ont., Jan. 22 (UTPS).—General Motors of Canada, Ltd., has appointed British and American Motors, one of the oldest established firms of its kind in Toronto, as new Chevrolet dealer. Located on Avenue Road, British and American Motors has a staff of sixteen salesmen and also a large staff of mechanics. A. S. Sharp is general manager, with K. S. McKinnon sales manager and E. R. Midghall, service manager.

FIVE NEW FORD DEALERS NAMED IN SEATTLE, WASH.

Seattle, Wash., Jan. 22.—With the establishment of five new Ford dealers in Seattle recently, there are now eighteen Ford dealerships in the city. The new ones follow: Griffith Motor Company, 405 15th N. St.; Irwin's, Inc., 620 East Pike St.; Walter R. McFarland, 2401 Fifth Ave.; Gerald Smith Motors, Mary and W. 85th St., and Yates Motor Company, 2701 California Ave. Early in the Spring the Kreitle Motors, Inc., 9445 McKinnon Road, opened for business.

The Ford assembly plant here is operating three days per week at the present time. Contract will soon be awarded for erection of a new plant to cost over $2,000,000, when schedule and payroll will be greatly increased. However, the new plant will not be completed until fall, and in the meantime it is expected local production will increase materially.

Reports show Ford sales in Seattle during 1930 exceeding 1929 sales by around 350.

FORD DEALER BOOSTING GREASING JOBS VOLUME

Omaha, Neb., Jan. 22.—The John Opitz Company, Ford dealer, at 38th and Farnam Streets, is increasing the volume of business of its service and shop department by advertising and specializing upon complete greasing jobs, for which a charge of 99 cents is made. The company claims to have the most up-to-date Ford service station and shop in Omaha.

In making new friends, in helping to sell cars, both new and used, Oakland-Pontiac advertising has the dealers' interests in mind.

OAKLAND 8
PONTIAC 6

Oakland Motor Car Co
Pontiac, Mich.
Division of General Motors

Making new friends ...and keeping the old

Automotive Daily News

"Of, By and For the Entire Automotive Industry"

Published Every Day Except Sunday and Monday by
AUTOMOTIVE DAILY NEWS PUBLISHING CORPORATION,
350 Hudson St., New York, N. Y.
O. J. Elder, President. H. A. Tarantous, Vice-President. Alexander Johnston, Secretary.

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2716 Graybar Bldg., New York, N. Y. Telephone MO hawk 4-6388

Circulation—Net paid Average over 10,000 daily guaranteed.
Member A. B. C.

FRIDAY, JANUARY 23, 1931

ADVERTISING AND BUSINESS HEADQUARTERS

Harry A. Tarantous, Business Manager. J. Edward Schipper, Eastern Manager.
George M. Slocum, Manager Detroit Bureau, 427-8 Fisher Building, Detroit, Mich., phone Empire 3560; Willard R. Cotton, Western Manager, 333 North Michigan Ave., Chicago, Ill., phone Central 5936; Metz B. Hayes, New England Manager, Little Building, Boston, Mass.; Blanchard, Nichols & Coleman, American National Bank Building, San Francisco, Cal.; Lincoln Building, Los Angeles, Cal.; 1037 Henry Building, Seattle, Wash. Address ALL advertising and business correspondence to 2716 Graybar Building, New York City.

EDITORIAL DEPARTMENT

350 Hudson St., New York, N. Y. Telephone CA nal 6-1000.
Alexander Johnston, Editor. William C. Callahan, News Editor.
Detroit Bureau—Chris Sinsabaugh, Editor, 427-8 Fisher Building, Detroit, Mich., phone Empire 3500. Contributing Editor, John C. Wetmore. A. Benson Carleton, Technical Editor.

Mail subscriptions to CIRCULATION DEPARTMENT—C. H. Wilson, Manager.
1926 Broadway, New York, N. Y. Telephone TR afalgar 7-4500
Subscription Rates—One year, $12.00; two years, $20.00, for United States and Canada.
To Foreign Countries—One year, $15.00; two years, $26.00. Single copies, 5 cents.

Thrift Week

UNNOTICED by most of us, January 17 marked the anniversary of an important event in the history of the United States. That day was the birthday of Benjamin Franklin, a patriot who offered advice in the days when this republic was forming, which, had our forefathers accepted it, would have saved us much anguish and woe.

However, while Benjamin Franklin lives as a patriot in the hearts of his countrymen, it is probably as a promoter of thrift that his memory is most cherished. It is appropriate, then, that the week containing his birthday, should be that which we celebrate each year as Thrift Week.

There have been times when we needed admonitions to thrift in its generally accepted sense; when he all needed reminding of the wisdom of saving money. This year the case is very different. True thrift in January, 1931, takes the form of intelligent spending. All through 1930 we saved our money. Savings bank and business bank deposits attest this fact. And now prices have reached levels where the careful citizen realizes that purchases made for future comfort or efficiency are the best investments he can make.

Almost as these words are read we shall have a fresh proof of this, in the exhibits that are being presented to the public at the Coliseum in Chicago. The automotive industry has once more taken the lead in bringing back prosperity. Prices on the new car lines have been reduced to a point where they are compelling sales arguments. The wise citizen, studying what his automotive dollar will buy today and realizing what his purchase will add to his efficiency, will feel certain that true thrift indicates the purchase of a new car and will act accordingly.

Detroit's Tunnel

ON November 3, 1930, the Detroit-Windsor tunnel was opened to traffic. In the slightly more than two months that have elapsed since then the tunnel has carried 189,585 vehicles. The number of bus passengers who have been carried under the river is given as 726,620 in this first nine weeks of operation. Total revenue derived from traffic was $172,629. The engineers estimated that the tunnel would carry 2,000,000 people a year.

This repeats the experience which New York has had with the Holland vehicular tunnel, where traffic has far surpassed any estimate that was made before the tube was placed in operation. The Holland tubes will pay for themselves in less than half the time that it was estimated it would take. The truth is that a transportation convenience of this kind has a way of creating traffic to use the service it provides. The experience with these two vehicular tunnels will be a valuable precedent in considering future improvements of the sort.

Wickersham Reverberations

AUTOMOBILE dealers, as such, will have only a secondary interest in the Wickersham report recently submitted to Congress. At the beginning of the prohibition era, there was a definite tendency in many sections to treat with scant respect the rights of automotive dealers in cars seized by the authorities for liquor carrying.

The Wickersham report, with its obvious and almost comic contradictions of individual opinion and formal recommendations, will certainly not encourage the fanatics, in court or out, in any plan to begin again the outrageous confiscations of motor vehicles, partly owned by dealers, that characterized the early days of prohibition. The present prohibition director, Col. Woodcock, when he took office, inaugurated a policy of protecting an innocent dealer in his unpaid balance against cars seized for violation of the Eighteenth Amendment. This policy will undoubtedly continue during the life of the prohibition law.

YOUNGSTOWN INSURANCE STILL HIGHEST IN OHIO

Youngstown, O., Jan. 22.—Personal liability and property damage insurance rates in the Youngstown area remain the highest in the state of Ohio following the recent nation-wide revision in rates by the National Bureau of Casualty and Surety Underwriters.

The temporary benefits to insured motor car owners, after a four-month campaign to suppress solicitation of personal injury claims by ambulance-chasing lawyers, have been partly removed by the revision in rates. Youngstown rates, once the hightest of any city under 500,000 in the country, continue to exceed those in effect at Columbus, Cleveland, Cincinnati, Dayton, Toledo and other Ohio cities.

The new rates on light cars in the "W" classification are $52 for "five and ten" personal liability protection with $13 for property damage. In 1930, the rate was $45 and $11. The present rates here compare with $41 and $13 at Cleveland.

EDISON GOES SOUTH IN FIRESTONE'S PRIVATE CAR

Newark, N. J., Jan. 22.—Thomas A. Edison left yesterday for Florida in the private car of Harvey Firestone on the Pennsylvania Railroad. With him were Mrs. Edison, her sister, Mrs. W. W. Nichols, and Mr. Nichols. Mr. Firestone boarded the train in New York.

COMING EVENTS

JANUARY

17-24—**Boston.** Automobile Show.
17-24—**Detroit, Mich.** Annual Show, Convention Hall.
17-24—**Hartford, Conn.** Automobile Show. at state armory.
17-24—**Montreal, Can.** National Motor Show of Eastern Canada at Stadium.
17-24—**Baltimore, Md.** Automobile Show.
17-24—**Pittsburgh, Pa.** Automobile Show.
19-23—**Detroit, Mich.** Society of Automotive Engineers' annual meeting.
19-24—**Omaha, Neb.** Automobile Show.
19-24—**Elmira, N. Y.** Automobile Show at Armory.
19-24—**Niagara Falls, N. Y.** Automobile Show.
19-24—**Omaha, Neb.** Automobile Show.
19-24—**Louisville, Ky.** Automobile Show.
19-24—**Rochester, N. Y.** Automobile Show.
23-24—**Oklahoma City.** Oklahoma Petroleum Marketers' Association meeting.
24-31—**Chicago, Ill.** National Automobile Show.
24-31—**Altoona, Pa.** Automobile Show at Jaffa Shrine Mosque.
24-31—**Allentown, Pa.** Automobile Show sponsored by Lehigh Automobile Trade Association.
24-31—**Cleveland.** Automobile Show.
24-31—**Washington, D. C.** Automobile Show.
24-31—**Albany, N. Y.** Automobile Show.
24-Feb. 1—**Los Angeles.** Automobile Show.
26-27—**Chicago.** National Automobile Dealers' Association convention.
26-31—**Springfield, Mass.** Automobile Show.
26-31—**Syracuse, N. Y.** Automobile Show at Armory.
26-31—**Portland, Maine.** Automobile Show at Exposition Building.
28-31—**Harrisburg, Pa.** Automobile Show.
29-30—**Grand Forks, N. D.** North Dakota Division, Northwest Petroleum Institute meeting.
31-Feb. 7—**San Francisco.** Automobile Show.

FEBRUARY

Jan. 31—Feb. 7—**Twin Cities.** Northwest Automobile Show, jointly sponsored by St. Paul and Minneapolis at the Minnesota State Fair Grounds.
2- 7—**Scranton, Pa.** Automobile Show.
2- 7—**St. Louis.** Automobile Show.
2—**Minneapolis.** Auto Trade Association convention.
7-14—**Los Angeles.** Automobile Salon.
7-14—**Kansas City.** Automobile Show.
9-14—**St. Petersburg, Fla.** Automobile Show at Winter Garden.
9-14—**Duluth, Minn.** Twin Ports Automobile Show, held by Duluth and Superior, Wis., dealers.
9-14—**Denver, Colo.** Automobile Show.
11-13—**Chicago, Ill.** American Society of Mechanical Engineers' fuel meeting.
14-19—**Indianapolis.** Automobile Show at State Fairground.
16-20—**San Francisco.** Society for Steel Treating National Western Metal and Machinery Exposition.
21-28—**San Francisco.** Automobile Salon.
21-28—**Quebec, Canada.** Automobile Show.
22-March 1—**Los Angeles.** Pacific Coast Transportation. Exposition at Shreve Civic Auditorium.
23-28—**Des Moines, Ia.** Automobile Show at Coliseum.
24-26—**Columbus, O.** Ohio Petroleum Marketers' Association meeting.
24-March 1—**Seattle, Wash.** Automobile Show at Civic Auditorium.
25-March 2.—**Camden, N. J.** Automobile Show.

MARCH

6-15—**Geneva, Switzerland.** Eighth Swiss International Automobile Show.
7-14—**Brooklyn, N. Y.** Automobile Show.
9-14—**Wichita, Kan.** Automobile Show at Forum.
11-13—**Detroit, Mich.** Michigan Oil Men's Association meeting.
16-22—**Los Angeles, Cal.** Second Annual Oil Equipment and Engineering Exposition.
19-21—**San Antonio, Tex.** Sixteenth annual meeting, American Association of Petroleum Geologists.
30-April 3—**Indianapolis, Ind.** Eighty-first meeting, American Chemical Society.

MAY

4- 9—**Charlotte, N. C.** Good Roads Convention.
9-Aug. 9—**Berlin, Germany.** International Garage Exposition.

Contemporary Comment

MOTOR trucks have materially assisted railways in relieving difficult transportation situations. They have kept open the channels of commerce when severe storms tied up railway facilities, and when strikes threatened to seriously disturb industry and the welfare of the nation.

"Substitution of motor transportation at a cost of 30 cents per mile for railroad services on lines where the volume of traffic failed to justify the $1.75 per mile cost of such service has resulted in greater transportation efficiency," A. F. Russell, vice-president of the New York, New Haven & Hartford Railroad declared at hearings of the Interstate Commerce Commission recently conducted in New England.

Mr. Russell stated that co-ordination of motor vehicle service with the regular rail service had resulted in a reduction of this heretofore unprofitable rail operation amounting to more than 30,000 train miles monthly.

Amplifying his testimony, the railroad leader described the development of motor vehicle co-ordination by the New Haven railroad to the point where its truck mileage exceeds 140,000 miles monthly.

Although inaugurated less than one year ago, the motor freight operations have resulted in decreased operating costs of the New Haven system, increasing the efficiency of its rail operations, and improved transportation service in the district served by the railroad. All this is, of course, reflected in lower living costs and greatly improved living conditions.

Without consideration, however, to the vital part which the motor truck plays in our own national life, the legislative bodies of many states direct no small part of their energies to scheming and planning new ways by which they can collect greater taxes from operators of commercial haulage equipment.

Studies by the National Automobile Chamber of Commerce disclose that in no case would it be possible for any truck to operate without paying, during the course of a year, at least $50 in taxes. That is the minimum. From that point the aggregate taxes between all trucks mounts rapidly, reaching an estimated maximum of $2,000. There is, at any rate, no basis for doubting that the aggregate tax paid by any truck is ever less than 6 per cent. of its possible earnings. The common carrier not only pays the regular taxes, but in addition thirty-four states have special forms of taxation which they add to the burden of the "for hire" truck. Here, again, there is a diversity of tax systems.

In seven states the common carrier fee is based on a percentage of the gross annual receipts or earnings. In one state this fee amounts to 6 per cent. of gross receipts and a gasoline tax of 5 per cent. prevails. Here certainly is a striking illustration of unjust motor truck taxation.

In five other states operators are assessed from 1 to 5 per cent. of their gross receipts.

Another type of tax proposed is that based on annual mileage, or ton mileage. There are eleven states where this is enforced. One state charges 5 mills per mile; 25 per cent. additional for solid tires; another charges ¾ cent per mile; another 1-5 cent per gross ton mile, and so on down the line.

Sixteen states have common carrier fees scaled either on capacity, gross or chassis weight, or on a flat rate. These fees vary from a minimum of $6 to a maximum of more than $600.

Protests voiced by powerful organizations of commercial haulage operators have checked the tidal wave of unjust legislation in many states. Industry in all lines apparently realizes that some effective action must be taken to secure for commercial haulage that consideration in the matter of taxation which will enable it to perform, with the utmost economy and efficiency, its vital function in the distribution of merchandise. Law makers are being brought to recognize that the welfare of industry as well as the general public is closely interwoven with the speed, flexibility and economical service provided by the motor truck.

It is high time for motor truck owners to make themselves felt in every state in the union. This can be done only by strong organization. As Napoleon said, "The way to insure victory is to always meet the enemy at the main point of attack with a superior force." Let's get into action with an aggressive, well-planned campaign. Start mobilizing at once and prepare to swing into the battle line a force that will carry through to victory.—**M. L. Pulcher in Federal Traffic News.**

* * *

OUR business index for December is 75.7, the lowest point touched by the index, and by the comparable Axe-Houghton index of business activity since March, 1908. Also from the standpoint of past experience business in December reached a degree of stagnation which has never before lasted more than two or three months at the outside; but the very severity of the present depression indicates that complete recovery to normal can hardly be expected inside of thirteen months and may take as long as nineteen months, which would place the date of the full recovery between the months of January and July, 1932. Meanwhile a tentative sign that we have reached the bottom of the depression is the absence of any further drastic decline in the December business index.—**The Annalist.**

1930 Replacement Market Establishes New Record; 'New Buyers' Drop Sharply

(Continued from PaPge 1)

tomobile market, held their purchases for a later date. That means that there now exists in the United States a delayed demand among this classification of potential car owners amounting to 50 per cent. of all the cars sold in the domestic market last year. These new buyers, of course, are not all individuals, but include many corporations that are constantly adding to their fleets of commercial cars.

The fact that replacement buying of motor cars in 1930 was greater than in 1929 does not mean that it was up to the normal expectation. The average life of a car in this country is placed at six and three-quarter years by the National Automobile Chamber of Commerce. This means that the 3,798,000 motor vehicles that went into the domestic market in 1923 should have been worn out by 1930.

But replacement buying accounted for only 2,815,000 vehicles, leaving 983,000 to be replaced at a later date. Of course, many of these particular vehicles were replaced earlier than 1930, many of them no doubt in 1929, when thousands of vehicles were discarded before their time, due to the wave of abnormal buying.

This means, therefore, that some 2,483,000 motor vehicles were not purchased in 1930 that normally would have gone into the market. This constitutes a delayed demand which, if satisfied all in one year, would mean a domestic market for nearly 6,000,000 cars and trucks. There is no expectation, however, that this delayed demand will be felt in any one year.

Such delayed buying constitutes a powerful background for the industry and gives some idea of what may be expected in the way of sales over the course of the next few years of normal business activity. It is no wonder that the most reliable statisticians of the industry are forecasting a 7,000,000 production year for the American automobile manufacturers within the next cycle of prosperity.

Retail sales of new passenger and commercial cars in the domestic market in 1930 amounted to 3,034,000 (December estimated), as compared with 4,408,000 in 1929, a decline of 31 per cent.

Sales of cars and trucks outside of the United States last year were placed by the National Automobile Chamber of Commerce at 561,000 units, as compared with 997,111 in 1929, a falling off of 43 per cent. The foreign sales in 1930 represented 15.7 per cent. of the total sales, as compared with 18.4 per cent. in the preceding year.

Total sales of cars and trucks made by American manufacturers amounted to 3,595,000 in 1930, as compared with 5,405,287 in 1929, a decline of 33 per cent. It will be noted that the sales of 3,595,000 last year compared with total production of 3,505,000. The difference of 90,000 represented the sale during the year of surplus vehicles carried over from the preceding year.

The following table shows the new motor vehicle sales for 1930, as compared with 1929:

	1930	1929	Per Cent. Drop
Replacement (U. S.)	2,815,000	2,800,000	*0.5
New car buyers (U. S.).	219,000	1,608,000	86.0
Total domestic ..	3,034,000	4,408,000	31.0
Exports	561,000	997,111	43.0
Total	3,595,000	5,405,287	33.0

*Increase.

PENNSYLVANIA TRUCK ASSOCIATION TO MEET

Philadelphia, Jan. 22.—The January dinner and meeting of the Pennsylvania Motor Truck Association, Inc., will be held on the night of January 28, at the Elks Club. A money-saving service, explained in cold facts and figures, will at that time be described to the members by a competent authority. Non-members have been invited to the business session to hear about this service.

200 SERVICE MEN AT CLINIC AT ALBANY, N. Y.

Albany, N. Y., Jan. 22.—The annual discussion of new products was attended recently by nearly 200 automobile and accessories dealers, garage and repair men at a meeting at the Peerless Auto Parts Company. Joseph Maas presided at the session.

Motion pictures were displayed under the direction of the Champion Spark Plug Company. Speakers included Joseph Maas, Phil F. Collier of the McQuay Norris Company, A. Donald Slaney, Packard Electric Company; Henry F. Salkeld, Champion Spark Plug Company, and Reginald P. Kinsley, Watervliet Tool Company.

BUICK NAMES M'DONNELL CHIEF OF PARTS, SERVICE

Portland, Ore., Jan. 22.—L. J. McDonnell has been appointed Pacific regional manager of Buick parts and service, according to word received by M. O. Anderson, Northwest Buick zone manager.

NEW YORK CITY TRUCKS DELIVERED BY AUTOCAR

New York, Jan. 22.—The initial delivery of thirty-five trucks for the Sanitary Commission of the city of New York, representing part of a contract for 204 trucks, was made yesterday by the Autocar Company.

This contract, which is the largest individual order ever received by the company amounts to approximately $1,000,000.

The shipment of trucks included several different types of bodies built under specifications of the Sanitary Commission and constructed to meet the special requirements of the department.

All of the trucks are of the covered type and will replace the old unhygienic type of open trucks which have been in the service of the sanitation department in the past.

FOUR CITIES COMBINE FOR AUTOMOBILE SHOW

Davenport, Ia., Jan. 22.—The first quad-city automotive show, in which twenty dealers from Davenport, Ia., Moline, Rock Island and East Moline, Ill., will participate, will be held February 4 to 7 in the Boone Building, Rock Island. Heretofore dealers in each city have staged separate shows, but a united exhibit is expected to be more economical, more effective from a sales standpoint and attract larger crowds.

The Boone Building has 45,000 square feet of floor space. Four orchestras have been engaged for the event, and committees named for other details of the exhibition. William Grampp, Davenport, is chairman of the dealers' group in charge of arrangements.

TIDE WATER LEASES SIX SERVICE STATIONS

Jersey City, N. J., Jan. 22.—The Tide Water Oil Sales Corporation has leased six service stations, four in Jersey City and one each in Weehawken and Kearny, at one cent a gallon. The stations and locations follow: Wilford Hoffman, 1719 Boulevard; Harry J. Fisk, 687 Montgomery St.; E. Mertern, 3403 Boulevard; Millard Boyd, Boulevard and Custer Ave., all in this city; George Miller, 177 Hackensack Plankroad, Weehawken; Albert Greaterex, 124-126 Johnston Ave., Kearny.

Maintenance costs are cut to the bone —reliability attains a new standard of comparison—where trucks and buses are equipped with Wisconsin Axles.

WISCONSIN AXLES

WISCONSIN AXLE CO.
Oshkosh Wisconsin

Cumulative New Commercial Car Registration Statistics, December, 1930

Some of this data has been published previously, but it is given here complete for the convenience of our subscribers.

Figures in this table are from R. L. Polk & Co. of Detroit, with the exception of Illinois, which are supplied by the Robinson Advertising Service, Springfield, Ill., and New Jersey, which are furnished by the New Jersey Motor List Co., New Car Division, Trenton, N. J. Readers desiring county, city or town lists, or lists of owners in any given section, may obtain these by addressing any of these three companies. Commercial Car Registrations do not include buses.

States	Autocar	Brockway-Indiana	Chevrolet	Diamond-T	Dodge	Essex	F. W. D.	Fargo	Federal	Ford	G. M. C.	International	Mack	Paige	Relay	Reo	Republic	Rugby	Sterling	Stewart	Studebaker	Whippet	White	Willys	Willys-Knight	Miscellaneous	Totals	States
Arkansas			6							9		2															17	Arkansas
Colorado			25		8					75		3	1			1	1	1					1	2		1	119	Colorado
Delaware		1	22							28	2	7								1							61	Delaware
Florida		1	179		15				1	430	2	20	2	2		3							8	2			665	Florida
Idaho			24		2					40	1	4									1		1				73	Idaho
Illinois	2	4	134	15	37				2	282	3	70	11			4		1	1			1	3	2		15	587	Illinois
Minn.			105	2	11		1	1	1	159	1	23				3					3		1	4		7	322	Minn.
N. Hamp.			24	1	1					23	1		1			1				1							53	N. Hamp.
†N. Jersey		1	34		15				1	78	5	7										1	4		1	6	153	N. Jersey
Nor. Car.		1	164		19	1				190	9	7				1					1	1	3	2		7	406	No. Car.
Nor. Dak.			7		1					14	2	5									1						30	N. Dak.
Okla.		1	62	3	18				1	105	4	13				1								1			209	Oklahoma
Rh. Isl.		1	16		6	1			2	47	1	7				6					1		1			1	90	Rh. Island
So. Car.		2	87		4					92	3	3														2	193	S. Carolina
S. Dak.			34	2	6					37	1	19				4		1			4			3		1	112	S. Dakota
Utah			15		3					36		1				1											56	Utah
West Va.		2	96	1	13			2	1	148	8	16				3	1			2	2	2	3	1		3	304	West Va.
Wisconsin			73	4	18				4	145	3	22			2				8		1		1	4		8	293	Wisconsin
D. of Col.			21	1	6				1	61	22	1	4			1			1		4		1			2	126	D. of Col.
Totals	2	14	1128	29	183	2	1	3	14	1999	68	230	19	2	2	29	2	3	10	4	18	5	27	21	1	53	3869	Totals
Ark., '29			33		1					32		1				1						1					69	Ark., 1929
Col., '29			15		8					36	6	7				1						2	1			2	78	Col., 1929
Del., '29	2	2	17		3					37	6					2							2			1	72	Del., 1929
Fla., 1929		6	120		10					228	1	9	1			10					1	4	1				391	Fla., 1929
Idaho, '29			18		3					34	1	7						1					1			1	66	Idaho, '29
Ill., 1929	4	5	150	33	29	1		4	2	281	26	59	11			12			4	3		10	5			49	688	Ill., 1929
Minn., '29		3	105		13			3	1	250	5	38	2			4		1			1	5	3			9	443	Minn., '29
N. H., '29			12		2					17		4	1			1							1				38	N. H., '29
N. J., '29		3	44		16			2	14	92	8	1	6			2			3			3	7			11	212	N. J., '29
N. C., '29			157		28	1		3	1	224	15	30	2				2	1		1		3	4			4	476	N. C., '29
N. D., '29			16							20	3	2										1					42	N. D., '29
Okla., '29	1	1	147	2	24			3	5	158	9	46	11			4					2	2	8		1	1	425	Okla., '29
R. I., '29	1		17	1	17			2		48	4	7	7			5		1		1	1	2					114	R. I., 1929
S. C., '29			52			5				78		3										1	2				141	S. C., 1929
S. D., '29			39		2					58	2	13	6			3						4				2	129	S. D., '29
Utah, '29			7		8					27	1	2				1		1				1					48	Utah, '29
W. V., '29		1	77		30	2			1	136	8	18			1	6	1	1		2	1	5	2			6	298	W. V., '29
Wis., 1929			125	2	23	2		2	5	220	16	23	4			13		2	9	2	3	7	6		1	10	475	Wis., '29
D. C., '29	1		14	4	6					57	9	3	1			2				4			11			3	115	D. C. '29
Totals	9	21	1165	42	223	11		19	29	2033	120	273	52		1	67	3	8	16	13	9	51	54	*	2	99	4320	Totals

*Not in production at that time. †Returns herewith are for two weeks only, balance of month included in the January report.

Production - - Engineering - - Factory -

Otto Cycle Engine With Fuel Injection

By C. FAYETTE TAYLOR, E. S. TAYLOR and G. L. WILLIAMS
Massachusetts Institute of Technology

The following, in part, is a paper presented before the annual meeting of the Society of Automotive Engineers, which is now in session in Detroit.

For this investigation, a single cylinder 5x7-inch N. A. C. A. universal test engine was used together with an electric cradle type dynamometer and other necessary equipment for a complete performance test of the engine.

Figure 1 shows the construction of the cylinder head. Attention is called to the location of the three spark-plug holes. It will be obsedved that the construction of the cylinder is not favorable to setting up turbulence.

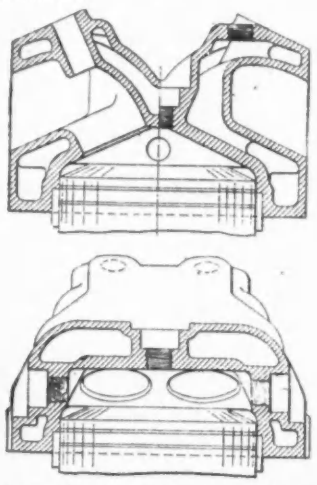


FIG. 1. Combustion chamber of N. A. C. A. universal test engine

A Bosch cam-operated, plunger-type fuel pump was used for injection, driven from a camshaft of the engine, through a gear coupling which permits adjustment of the ignition timing at will. The duration of injection for this investigation varied from 19 to 25 degrees of crankshaft rotation. A pressure of about six inches of mercury was maintained in the fuel system on the low-pressure side of the pump.

The injection valve used for cylinder injection is of a type developed especially for the purposes of this investigation. With high injection pressure, it has a high degree of atomization but very low penetration. The valve is spring loaded, so that a fuel pressure of about 3,000 pounds per square inch is required to open it. The fuel, passing out with high velocity between the valve and its seat, impinges almost perpendicularly upon the face of the hollow cone, which serves to atomize the fuel very thoroughly and at the same time to absorb a large portion of the velocity of the fuel particles. The resultant spray has the shape of a wide, short cone with an apex angle of about 100 degrees and is nearly solid except for a small hollow near the apex. This valve was used in the top spark-plug hole for all tests of injection into the cylinder. At the time of this writing this injection valve has been used for approximately forty hours under the various conditions of test work without trouble, either mechanical or from carbon deposit. A Bosch injection valve, with a pin-type spray nozzle, giving a 30-degree conical spray, was used for injection into the inlet pipe.

All tests were made at full throttle, with the load adjusted to maintain a constant speed of 1,500 revolutions per minute. Compression ratios from 3.5 to 1 to 5 to 1 were used for these tests. Most of the tests were made with a compression ratio of 4.3 to 1 and a constant spark aevance of 28 degrees. The mixture ratio was varied for each injection arrangement from the lean limit to very rich, and observations were taken during each run to determine the brake horse power, fuel consumption and air consumption.

Tests were made first with the conventional carburetor to afford a basis of comparison. Then the injection valve was placed in position in the inlet pipe to inject the spray in the same direction as the incoming air for the first set of runs. For the next group of runs, injection was down the pipe against the air flow. The Bosch valve was used for these runs and the carburetor was left in place with its fuel jets closed. The fuel was injected into the inlet pipe during the suction stroke, beginning 30 degrees after top center and continuing for about 21 degrees of crankshaft rotation.

Performance curves from these tests are shown in Fig. 2. There is seen to be little difference between the power obtained with the carburetor and that obtained with injection. Injection against the air-flow seems to be slightly better than injection in the same direction as the air-flow.

The outstanding indication of these curves is the fact that nearly full power is maintained with inlet-pipe injection to a leaner limit than can be obtained with the carburetor. Also, the minimum specific fuel consumption with inlet-pipe injection is considerably lower than that with the carburetor.

With injection of the fuel it is probable that more nearly the same amount of fuel gets into the cylinder for each explosion than with the carburetor. When the mixture ratio for successive explosions is not uniform, the effect on performance is exactly the same as the effect of unequal distribution of fuel between cylinders in a multi-cylinder engine.

The tests discussed in the foregoing were repeated with the carburetor removed and replaced with a section of plain tubing. The performance curves from these tests are shown in Fig. 3, in which the curves obtained with the carburetor functioning are plotted for comparison.

The principal effect of removal of the carburetor is a large increase in volumteric efficiency with a corresponding increase in brake mean effective pressure which may be considered a direct advantage of the manifold injection.

Fuel injection into the cylinder was through the top spark plug hole. The beginning of the injection was varied from 30 to 120 degrees after top center during the suction stroke. Injection timing later than these involve incomplete distribution of the fuel and incomplete vaporization which were augmented by the comparatively low temperatures at the end of compression in the Otto cycle which imposes limits on the ranges of combustible mixtures which are not present under high temperature conditions of the Diesel cycle. Furthermore it is necessary to have a combustible mixture between the sparking points. The duration of injection was about 21 degrees of crankshaft rotation.

When an injection valve with

(Continued on Page 11)

Drop Center Rim Development

By CHARLES S. ASH
Sales Engineer, Kelsey Hayes Wheel Corporation, Detroit

The following, in part, is a paper presented before the annual meeting of the Society of Automotive Engineers, which is now in session in Deroit.

The rim industry, having particular reference to passenger cars, has had somewhat of a diversified experience. Years ago, in the infancy of the automobile, the wheels were very large in diameter and the rims quite narrow in section. The section used was almost universally known as the plain clincher-type of rim. This was an endless rim adapated to use a tire having a soft or pliable bead. The tire was stretched or buttonholed over the rim flange in case of removal and mounting. This rim was a very suitable construction, so far as wheels and rims are concerned, but did not work out so well in connection with tires. The main trouble, I believe, was with rim-cuts around the edge of the rim.

The advent of the straight-side tire, which was supposed to eliminate rim-cuts and provide a more reliable bead-construction, necessitated a rim of complementary design. This straight-side tire had a more or less rigid bead-construction, so it could not be applied to the rim over the top of the rim flanges.

It was necessary to provide a rim with detachable side-flanges or rims that were split and which could be collapsed for tire removal. This type of construction has been very popular and practical for a number of years. However, during the last few years the trend has been towards smaller rim diameters and larger cross-section tires. At the same time the tire diameter has been somewhat decreased to bring the car lower to the ground. In fact, in some cases the rim diameter has been small enough to handicap the present type of construction.

In the case of the split straight-side rim, it is more difficult to collapse and, in the case of what is known as the "Q. D." rim, the side ring is somewhat difficult to apply and remove. These conditions, as well as features hereinafter described, have brought about the consideration of the drop-center-rim construction.

Definition of "Drop-Center" Rim

The term "drop-center rim" has been applied to a rim having a much different cross-section than either of the plain clincher or straight-side rims mentioned. The drop-center rim is an endless rim, both side flanges being integral. The center portion of the rim between the two tire-bead seats is depressed or rolled smaller in diameter to proview what is termed a "well." This well is so formed in proportion to the side flanges to facilitate the mounting and demounting of tires.

In removing the tire from a drop-

(Continued on Page 8)

CUMULATIVE NEW PASSENGER CAR

Figures in this table are from R. L. Polk & Co. of Detroit, with the exception of Illinois, which are supplied by the Robinson Advertising desiring county, city or town lists, or lists of owners in any given Some of this data has been published previously, but it is

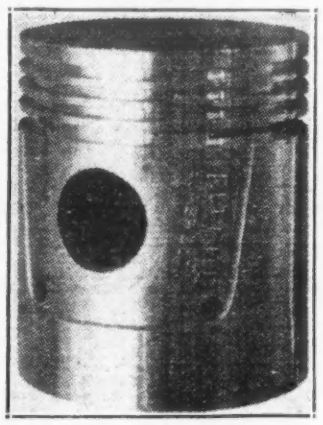
Returns for today:

States	Auburn	Austin	Buick	Cadillac	Chevrolet	Chrysler	Cord	De Soto	Dodge	Durant	Essex	Ford	Franklin	Gardner	Graham	Hudson	Hupmobile	Jordan	La Salle	Lincoln
Arkansas					22	4		1	2	1		28								
Colorado		8	48	4	195	18	1	6	16	6	19	216	4	1	16	9	13		2	3
Conn.	9	4	90	22	337	37	1	42	45	4	46	293	4		5	31	20		5	2
Delaware		1	26	5	105	9		1	3	5	14	123	1			4			3	1
Florida	5	21	113	20	1053	60	4	18	36	4	66	1017	14		41	34	14		7	4
Idaho			7		72	5		5	8	6	2	63			4		1			
Illinois	189	2	139	52	703	68	9	30	94	10	94	804	16	2	37	35	22		40	21
Minn.	1	1	50	12	545	24		6	17	6	26	442			22	16	4		4	2
Missouri	1	5	128	21	933	29	2	12	63	11	44	784	6	4	31	11	17		13	7
N. Hamp.	1	1	8	1	25	1		2	1	2	2	43	2			2	2			2
†N. Jersey	6	3	73	21	256	39	2	12	36	10	33	243	5	1	9	10	11		10	
N. Ca'lina	4	8	79	5	919	44	1	17	57	5	68	903	3		8	26	2		2	2
N. Dakota					32	1			1		4	49			1					
Ohio	128	19	324	52	2737	135	4	133	185	68	319	2928	23	1	97	170	67	2	24	4
Okla.	1	3	70	8	614	22		8	47		8	426	4		11	7	4		5	
Rh. Island		3	36	6	107	19		19	8	3	24	150	5		2	8	6		5	
S. Ca'lina		1	27	1	412	25		14	17		15	421			2	7	4		1	
So. Dakota		1	9	1	97	3		1	14	6	1	110	1		2	1	2			
W. Va.	2	4	33	3	404	29		12	49		37	334		1	11	14	7		4	4
Wis.	6	4	107	11	754	47	3	25	73	14	50	583	1		17	34	5		6	2
D. of Col.	7	1	46	5	236	13		6	27	4	20	341	6		13	6	13		8	3
Total	360	90	1413	250	10558	632	27	370	799	165	892	10301	95	10	329	425	214	2	139	57
Ark., '29			3		54	4		2	16	1	3	77								
Col., '29	7		67	3	108	24		12	31	24	31	234	4		12	11	28		3	
Conn., '29	14		63	23	182	46		43	214	6	74	273	10	3	34	23	36	2	20	6
Dela., '29	3		22	8	60	5		7	7	8	12	146				4	10		7	
Fla., '29	7		130	9	581	55	2	18	53	3	76	1093	3		42	48	26	1	27	1
Idaho, '29	4		18		149	4	1	5	41	14	9	258			7	2				
Ill., '29	23		262	50	542	157	15	65	467	35	189	1372	31	4	65	123	91	2	67	46
Minn., '29			49	3	407	37		26	51	41	59	771	1		10	17	9		8	1
Mo., '29	5		142	11	598	33	1	26	365	45	106	1207	17	3	51	16	42		19	5
N. H., '29	1		10		19	5		3	12	5	11	59	3		2	5	1		1	
N. J., '29	5		69	14	136	46	2	17	107	7	43	260	5		8	14	26	1	22	5
N. C., '29			108	8	908	115	1	46	149	30	101	1684	8		28	43	12		9	4
N. D., '29			3		49	2		1	2	3	2	111			1	1	1			
Ohio, '29	71		533	58	2370	270	9	213	548	207	831	4817	39	4	182	262	211	20	53	28
Okla., '29	6		245	8	1173	55	2	46	363	23	54	2090	4		34	14	31		18	2
R. Isle., '29	4		44	9	59	23	1	31	28	9	15	88	4		12	5	4		9	2
S. C., '29			28		342	12		13	13	1	15	491	1		3	12	5			
S. D., '29	2		17		202	8		6	30	11	15	339			7	6	16			
W. Va., '29	4		55	4	343	40		32	107	15	110	578	4		49	20	26	2	3	3
Wis., '29	2		143	13	483	53	4	30	291	23	93	852	3		27	49	32	3	16	4
D. of C., '29	8		38	5	125	28		9	42	8	35	319	3		29	18	13	1	6	7
Total, '29	166	*	2049	226	8890	1022	38	651	2937	519	1884	17119	140	14	603	693	620	32	288	114

*Not in production at that time. †Returns herewith are for two weeks only, balance of month included in the January report.

Equipment - - - Development

NEW ALLOY PISTON DEVELOPED FOR HEAVY DUTY



NEW Permite super-duty piston. Note slot in lower ring groove joined by vertical slot in skirt

Aluminum Industries, Inc., Cincinnati, has announced a new heavy-duty aluminum alloy piston for truck and bus engines. It is to be marketed under the trade name, "Permite Super-Duty." It is stated that the new piston was developed after extensive research and four years of tests on buses in continuous operation. The new piston is a full-trunk type, and is being manufactured in forty-three models. This number will be extended as occasion demands.

Strength is obtained by having heavy sections where necessary, which help to dissipate heat and promote lower operating temperatures. Head and skirt are broken only on the minor thrust face by a slot in the last ring groove, the latter also operating as a ventilator for an oil ring. Head heat is conducted to the skirt and dissipated to cylinder walls, as there is no restriction in the normal heat flow. The skirt vertical slot joins the top annular slot in the last ring groove, operating as an expansion and contraction control feature and also as a safety factor.

TWO PROMOTIONS MADE BY THE WHITE COMPANY

Cleveland, Jan. 22.—Two promotions, effective immediately, are announced by Vice-President and Sales Manager George F. Russell of the White Company.

R. H. Webb-Peploe, formerly district manager at New York city, has been appointed regional vice-president of the White Company to assume charge of the metropolitan region, with headquarters at Long Island City.

R. L. Boughton becomes manager of the export region, with headquarters at Cleveland. Mr. Boughton replaces Thomas Blagden, Jr., resigned.

Both men have records of achievement in the White organization. Mr. Webb-Peploe joined the company in 1923, as salesman at Baltimore. Mr. Boughton started with the company in February, 1919.

GENERAL TIRE MAKES NEW TUBE

GENERAL Retain-air tube

General Tire and Rubber Company, Akron, O., has just announced the General Retainer-air inner tube. While this is a development of the puncture-seal tube, the manufacturer points out that its ability to retain air is more important than its puncture-proof feature. According to the maker, it maintains air pressure evenly, because it loses less air than the average tire; it slows down tire tread wear because it maintains the tire in a proper position; it reduces inner carcass breaks and minimizes the danger of blowouts, it is claimed, and gives tire mileage averaging about 20 per cent. over the ordinary tube.

Rubber Problems Confronting The Automotive Engineer

By R. K. LEE
Engineering Department, Chrysler Corporation

The following, in part, is a paper presented before the annual meeting of the Society of Automotive Engineers, which is now in session in Detroit.

The fact that rubber is finding more applications in the construction of the automobile is borne out by the fact that in the Chrysler Corporation over 450 different rubber parts are used and 50 different rubber specifications have been compiled. In the Chrysler eight sedan there are 270 individual rubber parts which have a total weight of 141 pounds, which represent 3.8 per cent. of the car weight and approximately 8 per cent. of the total cost of the car in rubber.

In the use of metal parts, precedent has been established over a period of years, whihc makes it possible to turn to reference books and choose a standard material for a particular requirement. Similar data have not been available covering the specifications of rubber stock or design which will meet the requirements of the car which may be made in the best manner possible.

Here the author advised of the establishment of a rubber laboratory by the Chrysler Corporation in order to obtain such information as was required by the engineering department in designing rubber parts and also for specifying the quality of rubber so that the purchasing department would be able to buy from specifications. The equipment used was specified.

Through contacts with the rubber companies and tests run in the laboratory rubber parts are now used ranging from 500 to 5,000 lbs. per. sq. in. tensile strength, 200 to 800 per cent. elongation, 1.2 to 5 sp. gr. 2 to 70 per cent. crude rubber and costing from 8 to 80 cents per pound. The problem then is to choose the right compound for a specific place.

Following is a list of conditions which have been found important in connection with this choice of rubber qualities or stocks: Temperatures and fixed compression loads, abrasion, mechanical deflection or deformation, proportions between movements and volume, appearance or finish, chemical reactions on rubber and of rubber on other parts, manufacturing procedure, dimensional variations, change of physical properties due to aging.

Here the author described and illustrated some of the tests which are conducted in connection with the selection of rubber, and the following remarks constitute the salient points in connection with the requirements of rubber for different purposes:

The demands for certain parts made of rubber to maintain their original shapes when subjected to pressure and temperature forced the exploitation of this comparatively new property of rubber, or, rather, the extent of change in shape had to be greatly reduced over all previous stocks. The term adopted for this characteristic is "cold flow" or "flow." It relates to permanent set, but since this term had usually been associated with the tensile and elongation permanent deformations, this different term was selected to indicate the compression flow of rubber.

We know that when we keep the pressures on rubber of a specified quality down below twenty-five pounds per square inch and the temperature below 158 degrees Fahrenheit, the part being free from the action of oil or other destructive chemicals, we can expect a rubber having a tensile strength of 2,000 to 2,500 pounds per square inch, hardness from 40 to 60 Shore Durometer, and a cold flow of 15 to 20 per cent. to hold its dimensions within close limits over a period of three to four years.

When these conditions of temperature and pressure are exceeded, we must go into a much better grade of rubber and should analyze each problem separately and carefully. The physical properties which should guide the choice of stocks in these cases should include tensile strength, elongation, cold flow, hardness, aging due to heat and ultra-violet rays, modulus and permanent set in elongation.

Some rubber companies doubt the necessity of high tensile specification on compression stocks, but we have found that specifying over 3,000-pounds-per-square-inch tensile strength usually assures a much higher grade of stock, containing a higher percentage of new rubber than 2,000 pounds or under. This does not mean that some of the compounds using reclaimed rubber are not good stocks. This is illustrated by the fact that, now that rubber is ten cents and less per pound, all of the rubber companies continue the use of reclaims which cost just as much as new rubber and get a quality which is impossible to duplicate in stocks using 100 per cent. of new rubber.

Where a change in physical phoperties due to low temperatures affects the functioning of the piece, limits of change should be established. In connection with this

(Continued on Page 10)

REGISTRATION STATISTICS, DECEMBER, 1930

Service, Springfield, Ill., and New Jersey, which are furnished by the New Jersey Motor List Co., New Car Division, Trenton, N. J. Readers section, may obtain these by addressing any of these three companies given here complete for the convenience of our subscribers

Missouri and Ohio

States	Marmon	Nash	Oakland	Oldsmobile	Packard	Peerless	Pierce-Arrow	Plymouth	Pontiac	Reo	Studebaker	Stutz	Viking	Whippet	Willys	Willys-Knight	Miscellaneous	Totals
Arkansas		1	1		1			3	1								1	66
Colorado	8	21	4	11	6		3	11	15	2	11	1	1	5	10	3		697
Conn.	11	38	15	7	28	2	8	25	32	10	27	3	1	3	11	5		1,223
Delaware	3	5	1	1	7			6	15	1	4				4			348
Florida	4	60	8	16	16		4	45	43	18	36			9	18	3		2,811
Idaho		5	1	1	1			7	4		5		1	1	3			202
Illinois	21	111	8	25	87	5	25	46	63	27	138	6	1	8	21	14	14	2,987
Minn.	4	22	8	8	3	1		31	35	6	26			7	27	3		1,359
Missouri	16	42	20	35	17	4	21	50	49	10	32	1	4	12	37	21	7	2,500
N. Hamp.	1	6		2	1		1	1		1	3			1	1			113
N. Jersey	7	53	2	12	16	1	9	14	11	11	39	1	1	2	4	10		973
N. Ca'lina	2	22	3	8	12		4	46	45	1	22		1	8	10	1		2,338
N. Dakota		1	3	2				2	3		1				4			104
Ohio	130	157	60	117	60	98	20	233	278	78	170	5	15	89	211	78	11	9,230
Okla.	1	15	7	10	11		1	11	27	7	7			2	10	5	2	1,354
Rh. Island		18	4	8	10	2	7	12	7	17	20			4	5	6		521
S. Ca'lina	1	12	1	5	3			14	13	5	7			1	3	1		1,013
So. Dakota	1	4	4	12				10	3	1	9			1	4		1	299
W. Va.	22	33	10	13	9	1		48	34	18	19			10	23	2		1,190
Wis.	7	113	20	34	14	1	4	56	62	15	60	2	3	7	43	7	7	2,197
D. of Col.	3	15	6	11	18	36	5	13	13	5	29			1	7	7	8	932
Total	242	754	186	338	320	151	112	684	753	233	665	19	28	171	456	166	51	32,457
Ark., '29	1	2		2				5	2					5				177
Col., '29	11	32	4	14	7		6	19	20	5	11	3		25		13		769
Conn., '29	15	62	17	36	34	6	6	40	65	20	46	4	1	12		9	10	1,455
Dela., '29		9	3	5	6	1	2	7	19		3		1	7		2		364
Fla., '29	12	37	8	29	42		10	25	54	12	18		2	36		9		2,469
Idaho, '29	1	10	4	13	1			12	10	2	5			8		3	1	582
Ill., '29	28	110	41	121	111	15	16	67	102	21	86	13	8	71		14	70	4,500
Minn., '29	1	17	17	27	14		1	50	67	1	36	2		36		4	2	1,765
Mo., '29	26	51	25	53	41	11	13	56	71	8	68	2	2	98		15	8	3,240
N. H., '29	3	10		6	2			8	8	5	4			4		1		188
N. J., '29	6	57	11	35	24	2	13	12	39	4	29	2	2	21		9	6	1,059
N. C., '29	12	39	18	28	12	1	3	67	86	6	24			47		8		3,605
N. D., '29	1	3	5	2				4	16		1			11		1		220
Ohio, '29	120	258	142	330	128	69	23	285	487	48	223	12	23	587		155	53	13,669
Okla., '29	7	51	32	44	27		7	61	114	15	42	2	4	74		13	2	4,663
R. Isle., '29	1	17	8	13	6	5	5	10	16	9	10		1	10		9	3	470
S. C., '29	6	2	2	5	4		1	18	13		7			6				1,000
S. D., '29	4	10	8	21				23	14	2	10		2	28		2		783
W. Va., '29	23	47	14	35	15	1		50	46	15	18	3		44		15	2	1,723
Wis., '29	4	114	31	55	24	3	9	43	80	9	54	2		45		12	5	2,611
D. of C., '29	4	23	18	24	14	26	6	9	23	4	23			8		4	2	882
Total, '29	286	961	408	898	512	140	121	871	1352	186	718	45	46	1183	*	298	164	46,194

New Dealers Appointed

CALIFORNIA

Studebaker—Seth L. Barger, Red Bluff; Hart L. Weaver, Manteca.

CANADA

Hupmobile — Lawrence Naismith, Almonte, Ont.; Moreland Motors, Ltd., Montreal, Que.

ILLINOIS

Marmon-Roosevelt — South Side Marmon Sales and Service, Chicago.

INDIANA

Hupmobile—Grass Motor Company, Terre Haute.

Studebaker—Merkel Motor Company, Evansville.

KANSAS

Studebaker—Stewart Motor Company, Newton.

KENTUCKY

Studebaker—Hudson-Essex Sales Company, Prestonsburg.

MARYLAND

Studebaker—College Park Auto Place, College Park.

MISSOURI

Studebaker—Reece A. Marshall, Caruthersville.

MONTANA

Studebaker — Interstate Motors, Inc., Billings.

NEVADA

Hupmobile — Short-Gibson Company, Inc., Reno.

NEW HAMPSHIRE

Studebaker — Mitchell's Garage, Rochester.

NEW JERSEY

Marmon - Roosevelt — Fred H. Adams, Cliffside.

NEW YORK

Hupmobile—Glen-Myrtle Garage, Glendale, L. I.; Thompson & Andrews, Syracuse.

Marmon-Roosevelt—Lyle H. Corlette, Scotia.

Studebaker — Lanning & Folts, Herkimer; Powers' Garage, Inc., Oyster Bay, L. I.

NORTH DAKOTA

Studebaker—J. E. Sandlie, Inc., Grand Forks.

PENNSYLVANIA

Studebaker — Franklin T. Chapman, Inc., Philadelphia; Eighth Street Garage, Braddock.

SOUTH DAKOTA

Hupmobile — Arthur Everson, Platte.

UTAH

Hupmobile — Freed Motor Car Company, Salt Lake City.

WASHINGTON

Marmon - Roosevelt — University Marmon Company, Seattle.

Studebaker — Scott - Ford Motor Company, Olympia; Scott-Ford Motor Company, Shelton.

WISCONSIN

Studebaker—Dvorak Garage Company, Algoma.

HOFFMAN FAVORS NEW LAW TO COVER DEATHS BY NEGLIGENT OPERATION

Trenton, N. J., Jan. 22.—Enactment of a law in which a new crime, "involuntary homicide," will be set up covering the negligent operation of an automobile, resulting in a death will be recommended to the Legislature by Motor Vehicle Commissioner Harold G. Hoffman, he said today.

"Our department," he said, "has made a survey of cases involving criminal prosecutions for fatalities involved in automobile accidents in New Jersey. It disclosed that not only are convictions difficult to obtain for automobile manslaughter before a trial or petit jury, but that indictments before grand juries are difficult to obtain.

"Attempts have been made to overcome this by creating a special offense known as involuntary homicide. Rhode Island and Louisiana have recently adopted it and New York, Illinois and Ohio are considering its enactment."

NEW SERVICE GARAGE

Jamestown, N. Y., Jan. 22.—The Sundquist Garage and Service Station has been established in a building on Harrison Street here by A. L. Sundquist, specializing in servicing Franklin and Chrysler automobiles. Improvements to machinery and equipment are planned this spring.

Major Specifications and Mechanical Details of 1931 Commercial Cars

Make and Model	Capacity—Tons or Lbs.	Chassis Price	Engine	No. of Cyls.	Bore and Stroke	Tax H P.	Max. Brake H. P. at Specified R. P. M.	Oil System	Carburetor	Fuel Feed	Ignit. System	Gear Set	Location	No. Spds. For	Rear Axle	Final Drive	Reduction in Low	Brakes, Foot	Brakes, Hand	Standard Wheel Base	Chassis Weight	Front	Rear	Standard Tire Sizes
*Am La France Chief	2	3650	Own	6	3¾x5	33.7	65@2100	Pw	Str	Vac	DR	Own	C	4	Tim	Wo	31.2	4	D	156	6200	32x6		32x6D
Am. La France W	3-4	3950	Own 2 R	4	4¼x6	28.9	42@1400	CS	Zen	Vac	AB	Own	C	4	Own	2R	47.4	4	R	160	7200	S36x5		S36x5D
*Am. La Fr. Chieft'n	3-4	5500	Own	6	4½x5½	40.8	75@1800	Pw	Zen	Vac	DR	Own	C	4	Tim	Wo	28.8	4	D	175	7200	S36x8		36x8D
Am. La France V	5	5500	Own 5 R	4	4¾x6	36.2	50@1200	CS	Zen	Vac	AB	Own	C	4	Own	Wo	54.4	4	R	165	9800	S36x5		S40x6D
Am. La Fr. Big Chief	6	6725	Own	6	4½x6	48.6	50@1200	Pw	Zen	Vac	DR	Own	C	4	Own	2R	32.8	4W	D	226	10600	S40x8		S40x8D
Am. La France U	7½	6000	Own 5 R	4	4¾x6	36.2	50@1200	CS	Zen	Vac	AB	Own	C	4	Own	—	63.5	4	R	165	10500	S36x7		S40x8D
Austin	—	475	Own	4	2.2x3	7.8	———	CS	Til	—	Aut	W-G	U	3	Sal	Sp	—	4	4	75	———	3 75x18		3.75x18
Autocar A	1½-2	3200	Own	6	4 x4¾	38.4	82@2400	Pw	Str	Vac	DR	Br-L 51	U	4	Own	Sp	27.9	4V	R	150	5000	34x7		34x7
Autocar D	2-2½	3500	Own	6	4 x4¾	38.4	82@2400	Pw	Str	Vac	DR	Br-L 51	U	4	Own	2R	33.5	4V	R	150	5300	34x7		34x7D
*Autocar SH	2½-3	4300	Own	6	4¼x4¾	43.4	92@2400	Pw	Str	Gra	DR	Own T	U	4	Own	2R	44.0	RV	R	114	6770	34x7		34x7D
Autocar SCH	2½-3	4300	Own	6	4¼x4¾	43.4	92@2400	Pw	Str	Vac	DR	Own T	U	4	Own	2R	44.0	RV	D	157	6880	34x7		34x7D
*Autocar H	3	4100	Own	4	4½x5½	32.4	45@1450	CS	Str	Gra	DR	Own T	U	4	Own	2R	48.6	RV	R	114	6770	34x7		34x7D
*Autocar HS	3½	4600	Own	4	4½x5½	32.4	45@1450	CS	Str	Gra	DR	Own T	U	4	Own	2R	54.3	RV	R	114	7900	40x8		40x8D
*Autocar SHS	3-3½	4800	Own	6	4¼x4¾	43.4	92@2400	Pw	Str	Gra	DR	Own T	U	4	Own	2R	54.3	RV	R	114	7900	40x8		40x8D
*Autocar SCHS	3-3½	4800	Own	6	4¼x4¾	43.4	92@2400	Pw	Str	Vac	DR	Own T	U	4	Own	2R	54.3	RV	D	157	8180	40x8		40x8D
Autocar TEA	3-3½	5350	Own	6	4¼x4¾	43.4	92@2400	Pw	Str	Vac	DR	Own T	U	12	Own	2R	101.1	4V	D	192	8900	36x8		36x8D
Autocar TFA	3½-5	6100	Own	6	4½x4¾	48.6	101@2400	Pw	Str	Vac	DR	Own T	U	12	Own	2R	101.3	4V	D	192	9300	38x9		38x9D
Autocar C	3½-5	5500	Own	6	4½x4¾	48.6	101@2400	Pw	Str	Vac	DR	Own B	C	4	Own	2R	61.7	RV	D	172	9500	42x9		42x9D
Autocar CG	5	8250	Own	6	4½x4¾	48.6	101@2400	Pw	Str	Vac	DR	Own B	C	12	Tim	Wo	120	WB	D	196	13000	36x8		36x8B
Autocar F	7½	8400	Own	6	4½x4¾	48.6	101@2400	Pw	Str	Vac	DR	Br-L 70	C	7	Tim	Wo	94.0	4V	D	173	11000	36x7S		40x8DS
Autocar G	10	9000	Own	6	4½x4¾	48.6	101@2400	Pw	Str	Vac	DR	Br-L 70	C	7	Tim	Wo	100	WB	D	171	13000	36x8		36x8D
Chevrolet	½	355	Own	6	3⅛x3¾	26.3	50@2600	CS	Car	P	DR	Own	U	3	Own	Sp	13.61	4	R	109	1880	4.75x19		4.75x19
Chevrolet	1½	590	Own	6	3⅛x3¾	26.3	50@2600	CS	Car	P	DR	Own	U	4	Own	Sp	33.46	4	R	157	2890	30x5		30x5D
Chevrolet	1½	520	Own	6	3⅛x3¾	26.3	50@2600	CS	Car	P	DR	Own	U	4	Own	Sp	33.46	4	R	131	2560	30x5		32x6
Commerce Series S 11	1	1600	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Col	Sp	25.5	4	D	142	3900	P30x5		P30x5
Commerce Series S 11	1½	1900	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4300	P30x5		DP30x5
Commerce Series 40	1½	2990	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4700	P34x5		DP34x5
Commerce Series S 11	2	2030	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4500	32x6P		32x6D
Commerce Series 40	2	3240	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4900	32x6		36x6D
Commerce Series 40	2½	3240	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	5100	36x6P		36x6D
Commerce Series 60	2½	4580	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	U	5	Tim	Wo	63.0	4	D	175	7000	36x6P		36x6D
Commerce Series 60	3	4680	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	U	5	Tim	Wo	63.0	4	D	175	7100	36x6P		38x7D
Commerce Series 80	3½	5250	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	98.2	B	D	175	8200	36x6S		36x12S
Commerce Series 80	4	5330	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	98.2	B	D	175	8400	36x6S		36x14S
Commerce Series 100	5	5830	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	95.0	B	D	175	9600	36x6S		40x14S
Day Elder 60	1	1195	Con 25 A	6	3⅜x4	27.3	61@3000	Pw	Zen	P	DR	W-G	U	4	Tim	Sp	36.3	4	4	135	3200	20x6.00B		20x6.50B
Day Elder 85	1½	1645	Con 16 C	6	3⅜x4⅝	27.3	65@2700	Pw	Zen	P	DR	W-G	U	4	Tim	Sp	42.3	4	4	135	3750	20x6.00B		20x6.50DB
Day Elder 110	2	2095	Con 16 C	6	3⅜x4⅝	27.3	65@2700	Pw	Zen	P	DR	Br-L	U	4	Tim	Sp	44.9	4	D	156	4600	20x7.00B		20x7.00DB
Day Elder 130	2½	2895	Con 16 R	6	4 x4½	38.4	75@2400	Pw	Zen	P	DR	Br-L	U	4	Tim	Sp	40.7	4	D	150	6400	20x7.50B		20x9 00DB
Day Elder 160	3	3695	Con 18 R	6	4 x4½	38.4	82@2400	Pw	Zen	P	DR	Br-L	U	4	Tim	Wo	36.1	4	D	156	6600	20x7.50B		20x9.00DB
Day Elder 200	4	4295	Con 18 R	6	4 x4½	38.4	82@2400	Pw	Zen	P	DR	Br-L	U	4	Tim	Wo	43.5	4	D	156	7400	20x9.00B		20x9.00B
Day Elder 240	5	5500	Con 21 R	6	4⅜x4¾	45.9	100@2800	Pw	Zen	P	DR	Br-L	C	7	Tim	Wo	50.8	4	D	162	9300	38x9P		38x9DP
Day Elder 285	8	6000	Con 21 R	6	4⅜x4¾	45.9	100@2600	Pw	Zen	Vac	DR	Br-L	C	7	Tim	Wo	71.2	6	D	164	12000	20x8.25B		20x8.25DB
Day Elder 345	10	7500	Con 21 R	6	4⅜x4¾	45.9	100@2600	Pw	Zen	Vac	DR	Br-L	C	7	Tim	Wo	79.9	4	D	164	12500	20x9.00B		20x9.00DB
Day Elder 402	12	9000	Con 18 H	6	4¾x5¾	54.2	127@2300	Pw	Zen	Vac	DR	Br-L	C	7	Tim	Wo	84.6	4	D	164	14000	20x9 75B		20x9.75DB
Diamond T 200	1	675	Buda H 199	4	3¾x4½	22.5	57@3000	Pw	Zen	P	Aut	W-G	U	4	Cla	Sp	—	4H	B	128½	3050	P30x5		P30x5
Diamond T 216	1	695	Her JXA	6	3⅜x4¼	27.3		Pb	Zen	P	Aut	W-G	U	4	Cla	Sp	—	4H	B	135⅛	3300	20x6.50B		20x6.50B
Diamond T 291	1½	1475	Her WXA 2	6	3½x4½	29.4	58@2400	Pb	Zen	P	Aut	Cov	U	4	Cla	Sp	—	4H	D	156¼	4400	20x6.50B		20x6.50DB
Diamond T 303	2	1745	Her WKB	6	3¾x4½	33.7	66@2400	Pb	Zen	P	Aut	Cov	U	4	Cla	Sp	—	4HV	D	159¾	5000	20x7.00B		20x7.00DB
Diamond T 551	2½	2250	Her WXC	6	4 x4½	38.4	75@2400	Pb	Zen	P	Aut	Cov	U	4	Tim	Sp	—	4HV	D	168	5600	20x7.50B		20x7.50DB
Diamond T 504	2½	2675	Her WXC	6	4 x4½	38.4	75@2400	Pb	Zen	P	Aut	Cov	U	4	Wisc	2R	—	4HV	D	176½	6400	20x8.25B		20x8.25DB
Diamond T 506	2½	3000	Her WXC 3	6	4¼x4½	43.3	84@2200	Pb	Zen	P	Aut	Cov	U	5	Wisc	2R	—	4HV	D	174	6400	20x8.25B		20x8.25DB
Diamond T 603	3	3300	Her YXC	6	4⅜x4¾	45.9	94@2200	Pb	Zen	P	Aut	Cov	U	5	Wisc	2R	—	4HV	D	169	7500	20x9.00B		20x9.00DB
Diamond T 606	3	3440	Her YXC 2	6	4½x4¾	48.6	98@2200	Pb	Zen	P	Aut	Cov	U	5	Wisc	2R	—	4HV	D	187½	7500	20x9.00B		20x9.00DB
Diamond T 750	4	4800	Her YXC 4	6	4⅝x5¼	51.3	———	Pb	Zen	P	Aut	Cov	C	5	Wisc	2R	—	4W	D	178	8300	22x9.75B		22x9.75DB
*Diamond T 861	4	4140	Her YXC	6	4⅜x4¾	45.9	94@2200	Pb	Zen	P	Aut	Br-L	C	7	Tim	Wo	—	6HV	D	189½	8300	36x8P		4P 36x8
*Diamond T 1200	6	5600	Her YXC 2	6	4½x4¾	48.6	98@2200	Pb	Zen	P	Aut	Br-L	C	7	Tim	Wo	—	4RW	D	180	11000	34x7P		4wh 34x7D
*Diamond T 1600	8	6220	Her YXC 3	6	4⅝x4¾	51.3	106@2200	Pb	Zen	P	Aut	Br-L	C	7	Tim	Wo	—	4RW	D	190	11700	36x8P		4wh 36x8D
*Diamond T 1601	8	7500	Wak 6RB	6	5 x5¾	60.0	126@1800	Pb	Zen	P	Aut	Br-L	C	7	Tim	Wo	—	4RW	D	194	12500	36x8P		4wh 36x8D
Dodge Bros. UF10	½	435	Own	4	3⅝x4¾	21.2	48@2800	Pb	Car	P	DR	Own	U	3	Own	Sp	14.28	4	D	109	1855	5.00x19		5.00x19
Dodge Bros F10	½	515	Own	6	3⅛x4¼	23.4	61@3400	Pb	Car	P	DR	Own	U	3	Own	Sp	14.28	4	D	109	1960	5.25x19		5.25x19
Dodge Bros. U1	¾	695	Own	4	3⅝x4¼	21.3	45@2800	Pb	Car	Vac	NE	Own	U	3	Own	Sp	21.68	4	D	124	2260	5.50x20B		5.50x20B
Dodge Bros. DA1	¾	795	Own	6	3⅜x3⅞	27.3	63@3200	Pb	Zen	Vac	NE	Own	U	4	Own	Sp	36.83	4	D	140	2955	30x5		30x5
Dodge Bros. UF30	1½	595	Own	4	3⅝x4¾	21.0	48@2800	Pb	Car	P	DR	Own	U	4	Own	Sp	37.17	4	D	136	2665	6.00x20		32x6
Dodge Bros. F30	1½	695	Own	6	3⅛x4¼	23.4	61@3400	Pb	Car	P	DR	Own	U	4	Own	Sp	37.17	4	D	136	2765	6 00x20		32x6
Dodge Bros. F35	1½	1425	Own	6	3⅜x3⅞	27.3	63@3200	Pb	Zen	P	DR	Own	U	4	Own	Sp	41.43	4	D	140	3780	6.00x20		6.00x20D
Dodge Bros. F36	1½	1485	Own	6	3⅜x3⅞	27.3	63@3200	Pb	Zen	P	DR	Own	U	4	Own	Sp	41.43	4	D	165	3972	6.00x20		6.00x20D
Dodge Bros. F40	2	1995	Own	6	3⅝x5	31.5	96@3000	Pb	Zen	P	DR	Own	U	4	Own	Sp	43.73	4	D	150	5175	6.50x20		6.50x20D
Dodge Bros. F41	2	2085	Own	6	3⅝x5	31.5	96@3000	Pb	Zen	P	DR	Own	U	4	Own	Sp	43.73	4	D	165	5211	6.50x20		6.50x20D
Dodge Bros. F60	3	2645	Own	6	3⅝x5	31.5	96@3000	Pb	Zen	P	DR	Own	U	4	Own	Sp	48.87	4	D	146	5543	32x6		32x6D
Dodge Bros F61	3	2575	Own	6	3⅝x5	31.5	96@3000	Pb	Zen	P	DR	Own	U	4	Own	Sp	48.87	4	D	170	5789	32x6		32x6D
Dodge Bros. F62	3	2693	Own	6	3⅝x5	31.5	96@3000	Pb	Zen	P	DR	Own	U	4	Own	Sp	48.87	4	D	195	5901	32x6		32x6D
Essex Commercial	¾	445	Own	6	2¾x4½	18.2	———	CS	Mar	Vac	Aut	Own	U	3	Own	Sp	17.8	4	4	110	2150	30x5		31x5.50
Federal D	1½	830	Con W 10	4	3⅞x4¼	24.0	48@2500	Pb	Zen	P	DR	W-G T9	U	4	Cla	Sp	40.8	4	Tr	131	3185	6.00x20		32x6
Federal E6	1½	1090	Con 17 E	6	3⅜x4	27.3	60@2600	Pb	Zen	Vac	DR	W-G T9	U	4	Cla	Sp	34.6	4	Tr	132	3260	6.00x20		32x6
Federal F7	1½	1525	Con 16 C	6	3⅜x4⅝	27.3	64@2500	Pb	Zen	P	DR	Own	U	4	Tim	Sp	24.3	4	Tr	132	3765	30x5		30x5D
Federal A6	2	1855	Con 16 C	6	3⅜x4⅝	27.3	64@2500	Pb	Zen	Vac	DR	Own	C	4	Cla	Sp	38.5	4	Tr	151	4580	32x6		32x6D
Federal A6T	2½	2185	Con 16 C	6	3⅜x4⅝	27.3	64@2500	Pb	Zen	Vac	DR	Own	C	4	Tim	Sp	41.3	4	Tr	151	4950	32x6		32x6D
Federal A6TW	2½	2360	Con 16 C	6	3⅜x4⅝	27.3	64@2500	Pb	Zen	Vac	DR	Own	C	4	Tim	Sp	36.3	4	Tr	151	4950	32x6		32x6D
Federal T10B	2½-3	2740	Con 16 R	6	4 x4½	38.4	75@2200	Pb	Zen	P	DR	Own	C	4	Tim	Sp	36.3	4	Tr	165	6550	34x7		34x7D
Federal T10W	2½-3	2915	Con 16 R	6	4 x4½	38.4	75@2200	Pb	Zen	P	DR	Own	C	4	Tim	Wo	44.0	4	Tr	165	6550	34x7		34x7D
Federal U6	3-3½	3860	Con 18 R	6	4 x4½	38.4	85@2200	Pb	Str	P	DR	Br-L 55	C	7	Tim	Wo	64.6	4	D	165	7220	34x7		34x7D
Federal 4C6A	4-5	4735	Con 20 R	6	4⅛x4¾	40.8	90@2200	Pb	Zen	P	DR	Br-L 55	C	7	Tim	Wo	73.6	4	D	192	8330	36x8		36x8D
Federal 4C6AB	4-5	4960	Con 20 R	6	4⅛x4¾	40.8	90@2200	Pb	Zen	P	DR	Br-L 55	C	7	Tim	Wo	73.6	4	D	192	8850	36x8		36x8D
*Federal U6SW	6	6000	Con 20 R	6	4⅛x4¾	40.8	90@2200	Pb	Zen	P	DR	Br-L 55	C	7	Tim	Wo	71.3	6	Tr	201	9850	34x7		34x7D
*Federal U6SWAB	6	6500	Con 20 R	6	4⅛x4¾	40.8	90@2200	Pb	Zen	P	DR	Br-L 55	C	7	Tim	Wo	71.3	6	Tr	201	9900	34x7		34x7D
Federal X8	7½	5085	Con B 7	4	5 x6	40.0	61@1350	Pw	Zen	Vac	AB	Br-L 60	C	7	Tim	Wo	110.9	R	D	162	9750	36x6S		40x14S
Federal X8R	7½	5810	Con 21 R	6	4⅜x4¾	45.9	100@2200	Pb	Zen	P	DR	Br-L 60	C	7	Tim	Wo	110.9	R	D	162	10000	40x8		40x8D
*Federal 4C6SW	8	7500	Con 21 R	6	4⅜x4¾	45.9	100@2200	Pb	Zen	P	DR	Br-L 55	C	7	Tim	Wo	80.8	6	Tr	231	11500	36x8		36x8D
Ford AA	1½	495	Own	4	3⅞x4¼	24.0	40@2200	Sp	Zen	Gra	Own	Own	U	4	Own	St	42.24	4	R	131½	2723	6.00x20		32x6
Ford AA	1½	525	Own	4	3⅞x4¼	24.0	40@2200	Sp	Zen	Gra	Own	Own	U	4	Own	St	42.24	4	R	157	2811	6.00x20		6.00x20
F W D—H	1½	3300	Wis S U	4	4 x5	25.6	50@2000	Pb	Zen	Vac	Eis	Cotta	C	4	Own	St	38.1	4	R	121	5300	34x7		34x7
F W D—H6	2	3425	Wak	6	3¾x4½	29.4	72@2500	Pb	Zen	Vac	Eis	Br-L	U	4	Own	St	35.0	4	R	133	5500	34x7		34x7
F W D—BTL	2	3900	Wak	6	3¾x4¾	33.7	72@2500	Pb	Zen	Vac	Eis	Br-L	C	7	Own	St	84.7	4	R	137½	6000	36x8		36x8
F W D—HH6	2½	4000	Wak	6	3¾x4¾	33.7	72@2500	Pb	Zen	P	Eis	Br-L	C	7	Own	St	101.0	4	R	138	6400	36x8		36x8
F W D—B	3	4200	Own	4	4¾x5½	36.1	56@1350	Pb	Str	Gra	Eis	Own	C	3	Own	St	35.6	4	R	124	6460	36x6S		36x6S
F W D—BT	3-3½	4742	Wak	6	4⅛x5⅛	40.8	92@2300	Pb	Zen	Vac	Eis	Own	C	5	Own	St	101.0	4	R	137¾	7700	40x7S		40x58D
F W D—CU6	3½	5120	Wak	6	4⅛x5⅛	40.8	92@2300	Pb	Zen	Vac	Eis	Own	C	5	Own	St	88.6	4	R	148	7200	36x6S		36x8S
F W D—SSU	4	5220	Wak	6	4⅜x5⅛	45.9	102@2200	Pb	Zen	Vac	Eis	Own	C	5	Own	St	88.6	4	R	148	7600	38x9		38x9
F W D—M5	5	7600	Wak	6	4⅜x5⅛	45.9	102@2200	P	Zen	P	Aut	Br-L	U	8	Wis	2R	193.1	4V	D	165	11000	12.75x20B		12.75x20B
*F W D—X6	6	6500	Wak	6	4⅜x5⅛	45.9	102@2200	Pb	Zen	Vac	Eis	Own	C	5	Own	St	88.6	*	4	170	9500	36x8		36x8
F W D—M7	7½	8700	Wak	6	5 x5¾	60	127@2000	P	Zen	P	Aut	Br-L	U	8	Wis	2R	193.1	4V	D	165	13000	40x10P		40x10DP
Garford Series S 11	1	1600	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Col	Sp	25.5	4	D	142	3900	P30x5		P30x5
Garford Series S 11	1½	1900	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4300	P30x5		DP30x5
Garford Series 40	1½	2990	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4700	P34x5		DP34x5
Garford Series S 11	2	2030	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4500	32x6		D32x6
Garford Series 40	2	3240	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4900	36x6		D36x6
Garford Series 40	2½	3240	Bud D S 6	6	3⅜x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	5100	36x6		D36x6
Garford Series 60	2½	4580	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	U	5	Tim	Wo	63.0	4	D	175	7000	36x6		D36x6
Garford Series 60	3	4680	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	U	5	Tim	Wo	63.0	4	D	175	7100	36x6		D38x7
Garford Series 80	3½	5250	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	98.2	2	D	175	8200	S36x6		S36x12
Garford Series 80	4	5330	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	98.2	2	D	175	8400	S36x6		S36x14
Garford Series 100	5	5830	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Br-L	C	7	Tim	Wo	95.0	2	D	175	9600	S36x6		S40x14
Gen. Mot. T11-1001	3800	625	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Own	U	3	Pont	Sp	14.7	4	4	109⅜	1980	5.00x19B		5.50x19B
Gen. Mot. T15-1501	5400	645	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Own	U	3	Tim	Sp	16.14	4	4	130	2625	5.50x20B		5.50x20B
Gen. Mot. T17-1701	5500	665	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Own	U	3	Tim	Sp	16.04	4	4	130	2650	6.50x20B		6.50x20B
Gen. Mot. T17-1707	6500	680	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Own	U	3	Tim	Sp	16.04	4	4	130	2670	5.50x20B		32x6
Gen. Mot. T19-2201	6500	745	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Mun	U	4	Tim	Sp	34.45	4	D	130	2850	5.50x

Major Specifications and Mechanical Details of 1931 Commercial Cars

Make and Model	Capacity—Tons or Lbs.	Chassis Price	Engine	No. of Cyls.	Bore and Stroke	Tax H. P.	Max. Brake H. P. at Specified R. P. M.	Oil System	Carburetor	Fuel Feed	Ignit. System	Gear Set	Location	No. Spds. For.	Rear Axle	Final Drive	Reduction in Low	Brakes, Foot	Brakes, Hand	Standard Wheel Base	Chassis Weight	Standard Tire Sizes Front	Rear
Gen. Mot. T19-2214	8500	845	Pontiac	6	3⅛x3⅞	26.3	58@3000	Pb	Mar	P	DR	Mun	U	4	Tim	Sp	34.45	4	D	130	2925	30x5	30x5D
Gen. Mot. T25-2501	6800	1235	Buick	6	3⅛x4⅝	28.3	76@2500	Pb	Mar	P	DR	Mun	U	4	Tim	Sp	29.62	4	D	130	3375	6 00x20B	7.50x20B
Gen. Mot T25-2514	8000	1330	Buick	6	3⅛x4⅝	28.3	———	Pb	Mar	P	DR	Mun	U	4	Tim	Sp	29.62	4	D	130	3580	7.00x20B	700x20DB
Gen. Mot T30-3201	10000	1545	Buick	6	3⅛x4⅝	28.3	76@2500	Pb	Mar	P	DR	Mun	U	4	Eat	Sp	28.6	4	D	141	4490	30x5	30x5D
Gen. Mot T38-3204	12500	1700	Buick	6	3⅛x4⅝	28.3	———	Pb	Mar	P	DR	Mun	U	4	Eat	Sp	28.6	4	D	141	4705	32x6	32x6D
Gen. Mot T42-4201	12000	1845	Buick	6	3⅛x4⅝	28.3	76@2500	Pb	Mar	P	DR	Mun	U	4	Eat	Sp	33.38	4	D	141	4725	32x6	32x6D
Gen. Mot T42-4204	15000	1975	Buick	6	3⅛x4⅝	28.3	———	Pb	Mar	P	DR	Mun	U	4	Eat	Sp	33.38	4	D	141	4910	34x7	34x7D
Gen. Mot. T44-4401	12000	1965	Buick	6	3⅛x4⅝	28.3	76@2500	Pb	Mar	P	DR	Mun	U	4	Eat	2R	40.89	4	D	141	4825	32x6	32x6D
Gen. Mot. T44-4404	16000	2095	Buick	6	3⅛x4⅝	28.3	76@2500	Pb	Mar	P	DR	Mun	U	4	Eat	2R	40.89	4	D	141	5095	34x7	34x7D
Gen. Mot T60-6207	22000	3230	Buick	6	3¾x5	33.7	———	Pb	Mar	P	DR	Mun	U	4	Tim	Wo	52.53	4	D	154¼	7065	9.00x20B	9.75x20DB
Gen. Mot. T60-6202	16500	3035	Buick	6	3¾x5	33.7	94@2500	Pb	Mar	P	DR	Mun	U	4	Tim	Wo	52.53	4	D	154¼	6925	34x7	34x7L
Gen. Mot. T82-8202	19000	3795	Own	6	3¾x5	33.7	94@2500	Pb	Mar	P	DR	Mun	U	12	Tim	Wo	142.5	4	D	155	7500	9.00x20B	9.00x20DB
Gen. Mot. T82-8206	24000	4055	Own	6	3¾x5	33.7	94@2500	Pb	Mar	P	DR	Mun	U	12	Tim	Wo	142.5	4	D	155	7880	9.75x20B	10.50x20DB
Gen. Mot. T90-9001	23000	5285	Own	6	3¾x5	33.7	94@2500	Pb	Mar	P	DR	Mun	U	12	Tim	Wo	128.6	WR	D	185¼	9400	7.50x20B	7.50x20DB
Gen. Mot. T90-9004	28000	5455	Own	6	3¾x5	33.7	94@2500	Pb	Mar	P	DR	Mun	U	12	Tim	Wo	128.6	WR	D	185¼	9775	8.25x20B	8.25x20DB
Gramm AX-4	1	795	Con W-10	4	3⅞x4	24	50@2800	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	36.3	4	D	131	2900	6.50x20	6.50x20
Gramm AX-6	1	895	Con 25 A	6	3⅜x4	27.3	61@3000	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	36.3	4	D	131	2900	6.50x20	6.50x20
Gramm BX-4	1½	895	Con W-10	4	3⅞x4¼	24	50@2800	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	36.3	4	D	131	3100	6.00x20	6.00x20L
Gramm BX-6	1½	995	Con 25 A	6	3⅜x4	27.3	61@3000	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	36.3	4	D	131	3100	6.00x20	6.00x20D
*Gramm B	1¾	1495	Lyc 4 SL	6	3¼x4½	25.3	61@2900	Pb	Zen	Vac	Aut	Cov	U	4	Tim	Sp	34.3	4	D	140	3800	6.50x20	6.50x20D
*Gramm C	2	1795	Lyc ASA	6	3⅝x4½	31.54	82@2600	Pb	Zen	P	Aut	Cov	U	4	Tim	Sp	31	4	D	160	4820	7.00x20	7.00x20D
Gramm CX	2	1095	Con W-11	4	4⅛x4¼	27.2	55@2600	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	37	4	D	131	3300	6.50x20	6.50x20D
Gramm CX	2	1295	Con 16 C	6	3⅜x4⅝	27.3	70@3000	Pb	Til	P	Aut	W-G	U	4	Tim	Sp	37	4	D	131	3300	6.50x20	6.50x20D
*Gramm D	2½	1995	Lyc ASD	6	3¾x4½	33.7	90@2200	Pb	Zen	P	Aut	Cov	U	4	Tim	Sp	33	4	D	160	5100	7.50x20	7.50x20D
*Gramm E	3	2595	Lyc TS	6	3⅞x5	36	90@2200	Pb	Zen	P	Aut	Cov	U	4	Tim	Sp	35	4	D	160	5500	8.25x20	8.25x20D
*Gramm EY	3	3595	Con 20 R	6	4⅛x4¾	40.80	90@2200	Pb	Zen	P	Aut	Cov	U	4	Tim	Sp	30	4	D	190	6750	7.50x20	7.50x20D
*Gramm T-38	3	3595	Lyc TS	6	3⅞x5	36	90@2200	Pb	Zen	P	Aut	Ful	U	4	Wis	2R	45	D	R	153	7200	36x5S	36x10S
*Gramm O-45	4	3995	Lyc TS	6	3⅞x5	36	85@2200	Pb	Zen	P	Aut	Ful	C	8	Wis	2R	75.8	D	R	153	7700	36x5S	36x12S
*Gramm GY	4	4345	Con 21 R	6	4⅜x4¾	45.9	100@2200	Pb	Zen	P	Aut	Cov	U	4	Wis	2R	28	4	D	210	7200	8.25x20	8.25x20D
Gramm GW	4	5175	Con 21 R	6	4⅜x4¾	45.9	100@2200	Pb	Zen	P	Aut	Cov	U	4	Wis	2R	—	4W	D	157	8900	9.00x20	9.00x20D
*Gramm O-60	5	4745	Lyc TS	6	3⅞x5	36	———	Pb	Zen	P	Aut	Ful	U	8	Wis	2R	78.4	D	R	153	8800	36x6S	36x14S
*Gramm HY	5	6545	Con 16 H	6	4¾x5¾	54.15	127@2300	Pb	Zen	P	Aut	Ful	U	4	Wis	2R	25.2	4	D	236	9600	36x8	36x8D
International AW1	¾	720	Wak X A	4	3½x4½	19.6	30@2700	Pb	Zen	Vac	DR	Mec	U	3	Own	Sp	17.4	4	2	136	2620	5.25x20	5.25x20
Internat'n'l Sp. Del.	¾	720	Wak X A	4	3½x4½	19.6	30@2700	Pb	Zen	Vac	DR	Mec	U	3	Eat	Sp	60.3	4	2	124	2200	5.25x30	5.25x30
Intern'l 6 Spd. Spec.	1	820	Wak X A	4	3½x4½	19.6	30@2700	Pb	Zen	Vac	DR	Mec	U	3	Eat	Sp	52.6	4	2	124	2430	30x5	30x5
International S24	1¼	1160	Lyc C T	4	3¾x5	22.5	43@2350	Pw	Zen	Vac	DR	Own	U	3	Eat	Sp	21.3	4	2	130	3200	30x5	30x5
International S26	1¼	1310	Lyc 4 S L	6	3¼x4½	25.3	61@2800	Pb	Zen	Vac	DR	Own	U	3	Eat	Sp	21.3	4	2	130	3250	30x5	30x5
International AW2	1½	820	Wak X A	4	3½x4½	19.6	30@2700	Pb	Zen	Vac	DR	Mec	U	3	Own	Sp	60.3	4	2	136	2980	5.50x20	6.00x20
International SF34	1½	1450	Lyc C T	4	3¾x5	22.1	43@2350	Pw	Zen	Vac	DR	Own	U	3	Eat	Sp	22.6	4	2	140	3520	30x5	32x6
International AL3	1½	1450	Lyc SLH	6	3¼x4½	25.3	61@2800	Pb	Zen	Vac	DR	W-G	U	4	Own	Sp	42.9	4	2	138	4300	6.00x20	6 00x20L
International SF36	1½	1600	Lyc 4 S L	6	3¼x4½	25.3	61@2800	Pb	Zen	Vac	DR	Own	U	3	Eat	Sp	22.6	4	2	140	3570	30x5	32x6
International SD44	2	1590	Lyc C T	4	3¾x5	22.5	43@2350	Pw	Zen	Vac	AB	Own	U	4	Eat	Sp	40.6	4	2	117	3700	30x5	32x6
International SD46	2	1740	Lyc 4 E L	6	3¼x4½	25.3	61@2800	Pb	Zen	Vac	AB	Own	U	4	Eat	Sp	40.6	4	2	117	3750	30x5	32x6
International SF46	2	1950	Lyc 4 S L	6	3¼x4½	25.3	61@2800	Pb	Zen	Vac	DR	Own	U	4	Eat	Sp	40.6	4	2	140	4000	32x6	32x6D
International A4	2	1985	Own F B B	6	3⅝x4½	31.5	65@2800	Pb	Zen	Vac	DR	Own	U	5	Own	Sp	47.8	4	2	145	5070	32x6	32x6D
International HS54	2½	3850	Hall-S 151	4	4¼x5½	28.9	54@1800	Pb	Zen	Vac	RB	Own	U	5	Eat	2R	60.5	4	4	148	8000	36x5S	36x8S
International HS54C	2½	3850	Hall-S 151	4	4¼x5½	28.9	54@1800	Pb	Zen	Vac	RB	Own	U	5	Own	Ch	63.8	4	4	148	8665	36x5S	36x10S
International W1	2½	3850	Hall-S 151	4	4¼x5½	28.9	54@1800	Pb	Zen	Vac	RB	Own	U	5	Own	2R	60.5	4	2	148	8300	36x5S	36x8S
International A5	3	2550	Own F B B	6	3⅝x4½	31.5	65@2800	Pb	Zen	Vac	DR	Own	U	5	Own	Sp	52.6	4	2	156	5600	34x7	34x7D
International A6	3	2675	Own B B	6	3⅝x4½	31.5	65@2800	Pb	Zen	Vac	DR	Own	U	5	Own	Sp	62.5	4	2	156	5750	34x7	34x7D
International HS74	3½	4850	Hall-S 152	4	4¾x5½	36.1	60@1800	Pb	Zen	Vac	RB	Own	U	5	Eat	2R	70.5	4	4	160	10700	36x5S	40x12S
International HS74C	3½	4850	Hall-S 152	4	4¾x5½	36.1	60@1800	Pb	Zen	Vac	RB	Own	U	5	Own	Ch	79.1	4	4	160	11000	36x6S	40x12S
International W3	3½	4850	Hall-S 152	4	4¾x5½	36.1	60@1800	Pb	Zen	Vac	RB	Own	U	5	Own	2R	70.5	4	2	160	10125	36x6S	40x12S
International HS104C	5	5500	Hall-S 152	4	4¾x5½	36.1	60@1800	Pb	Zen	Vac	RB	Own	U	5	Own	Ch	90.5	4	4	160	11095	36x6S	40x14S
La France-Rep. A1	6000	795	Lyc	6	3 x4¾	21.5	60@2500	Pb	Zen	Vac	Aut	Ful	U	4	Tim	Sp	36.1	4	Tr	132	3000	5.50x20	32x6
La France-Rep. C1	7500	1295	Lyc	6	3¼x4½	25.4	61@2750	Pb	Zen	Vac	Aut	Ful	U	4	Tim	Sp	29.1	4	Tr	144	3300	6.00x20	32x6
La France-Rep. D1	9000	1595	Lyc	6	3¼x4½	25.4	61@2750	Pb	Zen	Vac	Aut	Ful	U	4	Tim	Sp	37.9	4	Tr	144	3725	30x5	30x5D
La France-Rep F2	13000	2395	Lyc	6	3⅝x5	31.5	83@2800	Pb	Zen	Vac	Aut	Ful	U	4	Tim	Sp	40.1	4	D	174	5400	32x6	32x6D
La France-Rep. H2	15000	2985	Lyc	6	3⅞x5	36.0	85@2300	Pb	Zen	Vac	Aut	Ful	U	4	Tim	Sp	44.5	4	D	174	5850	34x7	34x7D
La France-Rep. 35-2	24000	5600	Wak	6	4½x5¾	48.6	98@1850	Pb	Zen	Vac	Aut	Ful	U	4	Wis	2R	45.4	4	D	174	8200	38x9	38x9D
La France-Rep. M2	20000	4000	Wak	6	4⅜x5⅛	46.0	97@2000	Pb	Zen	Vac	Aut	Ful	U	5	Wis	2R	62.3	4	D	174	6900	36x8	36x8D
Mack BL	1	2860	Own	6	3¼x5	25.39	63@2800	Pw	Str	Vac	NE	Own	U	4	Own	Sp	Opt	4	D	148	———	B6.00x20	DB6.00x20
††Mack BG	1½	3000	Own	6	3⅝x5	31.57	75@2600	Pw	Str	Vac	NE	Own	U	4	Own	Sp	Opt	4	D	156	———	32x6	D32x6
Mack AB	2½-3	3950	Own	4	4¼x5	28.9	60@2200	Pb	Str	Gra	RB	Own	U	4	Own	2R	Opt	R	D	2-Opt	———	36x4S	36x8S
††Mack AB	2½-3	3500	Own	4	4¼x5	28.9	60@2200	Pb	Str	Gra	RB	Own	U	4	Own	Ch	Opt	R	D	2-Opt	———	36x4S	36x8S
Mack AB	2½-3	4750	Own	6	3⅝x5	31.57	75@2600	Pw	Str	Vac	NE	Own	U	4	Own	2R	Opt	R	D	2-Opt	———	34x7	D34x7
††Mack AB	2½-3	4300	Own	6	3⅝x5	31.57	75@2600	Pw	Str	Vac	NE	Own	U	4	Own	Ch	Opt	R	D	2-Opt	———	34x7	D34x7
††Mack B	3-4	5250	Own	6	4 x5½	38.4	100@2300	Pb	Str	Vac	NE	Own	U	4	Own	2R	Opt	4	D	2-Opt	———	36x8	D36x8
††Mack BC	3½-5	5500	Own	6	4 x5½	38.4	100@2300	Pb	Str	Vac	NE	Own	U	4	Own	Ch	Opt	4	D	2-Opt	———	36x8	36x8D
††Mack BJ	3½-5	6150	Own	6	4⅛x5½	48.6	126@2200	Pb	Str	Vac	L-N	Own	C	4	Own	2R	Opt	4	D	3-Opt	———	36x8	36x8D
††Mack AK	3½-5	5150	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	J	4	Own	Ch	Opt	4	J	3-Opt	———	36x5S	36x5DS
††Mack AK	3½-5	5250	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	C	4	Own	2R	Opt	4	D	3-Opt	———	36x5S	36x5DS
††Mack AC	3½-5	4950	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	J	4	Own	Ch	Opt	J	R	3-Opt	———	36x5S	40x10S
††Mack AK	3½-5	6450	Own	6	4⅛x5½	48.6	126@2200	Pb	Str	Vac	L-N	Own	C	4	Own	2R	Opt	4	D	3 Opt	———	10.50x22B	10.50x22DB
††Mack AC	5½-7	5500	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	J	4	Own	Ch	Opt	J	R	3-Opt	———	36x6S	40x12S
††Mack AC	5½-7	6550	Own	6	4⅛x5½	48.6	126@2200	Pb	Str	Vac	L-N	Own	J	4	Own	Ch	Opt	4	J	3 Opt	———	10.50x24B	10.50x24DB
††Mack AC	7½	6000	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	J	4	Own	Ch	Opt	J	R	3-Opt	———	36x7S	40x14S
††Mack AF	7½	9500	Own	6	5 x6	60.0	150@2000	Pb	Str	Gra	NE	Own	J	4	Own	Ch	Opt	R	J	191	———	36x7S	40x8DS
††Mack AC 6-wheel	10	7500	Own	4	5 x6	40.0	77@1800	Pb	Str	Gra	RB	Own	J	4	Own	Ch	Opt	4R	J	3-Opt	———	36x7S	40x12S
††Mack AF 6-wheel	10	12000	Own	6	5 x6	60.0	150@2000	Pb	Str	Gra	NE	Own	J	4	Own	Ch	Opt	4R	J	3-Opt	———	36x7	40x12S
Paige	½	895	Own	6	3¼x4½	23.44	66@3200	Pb	DL	P	DR	—	U	3	—	Sp	14.27	4	Tr	115	———	5.50x18B	5.50x18B
Relay Series 15 AA	¾	1370	Con 17 E	6	3⅜x4	27.3	52@2200	Pb	Str	Vac	Aut	W-G	U	4	Own	2R	38.4	4	D	131	3750	30x5P	30x5P
Relay Series 15 AB	1	1400	Con 17 E	6	3⅜x4	27.3	52@2200	Pb	Str	Vac	Aut	W-G	U	4	Own	2R	38.4	4	D	131	3800	P30x5	P30x5
Relay Series S 11	1	1700	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	25.5	4	D	142	4050	30x5P	30x5P
Relay Series S 11	1½	1900	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	30.0	4	D	162	4500	30x5P	30x5DP
Relay Series 40	1½	2990	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	34.5	4	D	168	5300	34x5P	34x5DP
Relay Series 40	2	3240	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	34.5	4	D	168	5500	36x6	D36x6
Relay Series 50	2	3860	Bud D W 6	6	3¾x5	33.7	73@2200	Pb	Zen	Vac	Aut	Br-L	U	5	Own	2R	58.5	4	D	161	6800	36x6	D36x6
Relay Series S 11	2	2030	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	30.0	4	D	162	4700	32x6P	32x6DP
Relay Series 40	2½	3275	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Own	2R	34.5	4	D	168	5700	36x6	D36x6
Relay Series 50	2½	4000	Bud D W 6	6	3¾x5	33.7	73@2200	Pb	Zen	Vac	Aut	Br-L	U	5	Own	2R	58.5	4	D	161	7000	36x6	D38x7
Relay Series 60	2½	4555	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	C	5	Own	2R	58.5	4	D	175	7350	36x6	D36x6
Relay Series 50	3	4130	Bud D W 6	6	3¾x5	33.7	83@2100	Pb	Zen	Vac	Aut	Br-L	U	5	Own	2R	58.5	4	D	161	7200	36x6	D40x8
Relay Series 60	3	4595	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	C	5	Own	2R	58.5	4	D	175	7500	36x6	D38x7
Relay Series 80	3	5170	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Cov	C	8	Own	2R	84.18	4	D	175	8400	36x6	S40x10
Relay Series 60	3½	4745	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	C	5	Own	2R	58.5	4	D	175	7800	38x7	D40x8
Relay Series 80	3½	5330	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Cov	C	8	Own	2R	84.18	4	D	175	8600	36x6	S40x12
Relay Series 80	4	5380	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Cov	C	8	Own	2R	84.18	4	D	175	8800	38x7	S40x14
Relay Series 50 SW	5	5505	Bud D W 6	6	3¾x5	33.7	83@2100	Pb	Zen	Vac	Aut	Br-L	U	5	Own	2R	54.7	6	D	152	8600	36x6P	36x6DP
Relay Series 100	5	6615	Con 21 R	6	4⅜x4¾	45.9	100@2200	Pb	Str	Vac	Aut	Ful	C	5	Own	2R	58.5	4	D	230	10000	9.00x24	D9.00x24
Relay Series 60 SW	7	6545	Bud B A 6	6	4⅛x5⅛	40.8	100@2200	Pb	Zen	Vac	Aut	Ful	U	5	Own	2R	63.6	6	D	175	12000	38x7P	40x8DP
Reo 15 Junior	½	785	Con 19 E	6	3⅜x4	27.3	60@2800	Pb	Sch	P	DR	W-G	U	3	Sal	Sp	14.63	4	Tr	115	2290	6.00x18	6.00x18
Reo D F 129	1	1095	Own C A	6	3⅜x5	27.3	85@3200	Pb	Sch	Vac	DR	Own	U	3	Own	Sp	17.1	4	Tr	129	3050	6.00x20	32x6
Reo D F	1	1095	Own C A	6	3⅜x5	27.3	85@3200	Pb	Sch	Vac	DR	Own	U	3	Own	Sp	17.1	4	Tr	135	3200	6.00x20	32x6
Reo F A	1½	1295	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	34.32	4	Tr	137	3525	6.00x20	32x6
Reo F E	1½	1395	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	34.32	4	Tr	152	3700	6.00x20	32x6
Reo F F	1½	1395	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	34.32	4	Tr	156	3750	6.00x20	32x6
Reo F H	2	1595	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	37.6	4	Tr	142	4165	32x6	32x6D
Reo F C	2	1645	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	37.62	4	Tr	152	4025	32x6	32x6D
Reo F D	2	1745	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	37.62	4	Tr	168	4075	32x6	32x6D
Reo G A	3	2035	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	41.05	4	Tr	163	4625	32x6	32x6D
Reo G C	3	2140	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	41.05	4	Tr	179	4850	32x6	32x6D
Reo G D	3	2085	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	78.1	4	Tr	144	4570	32x6	32x6D
Reo G C S	3	2375	Own	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	41.05	4	Tr	210	5320	32x6	32x6D
Reo G B	3	2290	Own C F	6	3⅜x5	27.3	67@2800	Pb	Sch	Vac	DR	Own	U	4	Own	Sp	40.52	4	Tr	179	———	7.50x20	7.50x20
Rugby 6-14	½	655	Con	6	3¼x4	25.4	58@3100	Pb	Str	P	Aut	Own	U	3	Own	Sp	15.6	4	4	---	2160	29x5	29x5
Rugby 6-15	1⅛	930	Con	6	3¼x4	25.4	58@3100	Pb	Str	P	Aut	Br-L	U	4	Sal	Sp	34.49	4	Tr	135	3000	5.50x20	30x5D
Selden 17 C	1½	1500	Con	6	3⅜x4	27.3	61@3000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	—	4	D	142	3900	32x6	32x6
Selden 317 C	1½	1610	Con	6	3⅜x4⅝	27.34	65@2760	Pb	Str	Vac	Aut	Br-L	U	4	Tim	Sp	—	4	D	142	3900	32x6	32x6
Selden 37 C	2	1935	Con	6	3⅜x4⅝	27.34	65@2760	Pb	Str	Vac	Aut	Br-L	U	4	Tim	Sp	—	4	D	151	4800	32x6	32x6D
Selden 39 C	2½	2920	Con	6	4 x4⅛	38.4	72@2400	Pb	Str	Vac	Aut	Br-L	U	4	Tim	Sp	—	4	D	164	5800	32x6	32x6D
Selden 47 C B	3½	3785	Con	6	4 x4½	38.4	85@2400	Pb	Str	Vac	Aut	Br-L	U	4	Tim	Sp	—	4	D	171	7200	34x7	34x7D
Selden 47 C D	4	4435	Con	6	4 x4½	38.4	82@2400	Pb	Str	Vac	Aut	Br-L	U	5	Wis	2R	—	4	D	171	7600	36x8	36x8D
Selden 67 C	5	4975	Con	6	4⅜x4¾	45.94	100@2400	Pb	Str	Vac	Aut	Br-L	C	7	Wis	2R	—	4	D	171	8700	36x8	36x8D
Selden 77	7	7365	Con	6	4¾x5¾	54.15	———	Pb	Str	Vac	Aut	Br-L	C	7	Wis	2R	—	4	D	178	12000	36x7	40x7D
Service Series S 11	1	1600	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Col	Sp	25.5	4	D	142	3900	P30x5	P30x5
Service Series S 11	1½	1900	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4300	P30x5	DP30x5
Service Series 40	1½	2990	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4700	P34x5	DP34x5
Service Series S 11	2	2030	Bud H S 6	6	3⅜x4½	27.3	52@2200	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Sp	29.2	4	D	162	4500	32x6	D32x6
Service Series 40	2	3240	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	4900	36x6	D36x6
Service Series 40	2½	3240	Bud D S 6	6	3⅝x5	31.5	56@2000	Pb	Zen	Vac	Aut	Br-L	U	4	Tim	Wo	34.8	4	D	168	5100	P36x6	D36x6
Service Series 60	2½	4580	Bud B A 6	6	4⅛x5⅛	40.8	83@2100	Pb	Zen	Vac	Aut	Ful	U	5	Tim	Wo	63.0	4	D	175	7000

Automotive Engineering Rubber Problems

(Continued from Page 7)

property of rubber, we have been able to effect, by compounding, a difference of over 50 per cent. in the force necessary to deflect rubber a given distance at 0 degrees Fahrenheit for the same hardness of rubber.

Abrasion

Parts such as mats and step pads should be considered from this standpoint. About the only way we have found to satisfactorily test abrasion is to compare the condition of samples of materials placed on a stairway in the factory where there is considerable use. A point that should be considered along with abrasion is that of design or figure of mats. We have found that the designs having irregular embossed surface show the effects of abrasion much sooner than the plan regular-stripe designs for the same volume of material worn from the mat.

Mechanical Deflation or Deformation

Where a part must be subjected in service to continued deformation, extreme care should be taken to prevent localized strains, just as in steel or other manufacturing materials. Also, localized abrasions are frequent and harmful.

An example of the working out of continued deflection of rubber under compression is the Silent-Bloc spring shackle. When this bushing was submitted to us we had considerable trouble getting over 5,000 miles on test cars without replacing bushings. We found that the unit pressure on the bushings were extremely high and the deflections out of proportion to the volume of rubber used. As soon as these properties were corrected, the life was extended to a point where it is impossible, under ordinary circumstances, to wear out the bushinn in the life of the car.

On one test run of 966 miles with a five-passenger load, the indicator developed for interpreting oscillations in car miles showed a total of 108,300 inches of axle movement. This is approximately 112 inches of axle movement, or 66 degrees shackle movement, per mile on the rear spring maximum-angle shackle. On the laboratory test, after 2,218,000 oscillations, the bushings are still in usable condition. This represents 217,000 miles on the car. The tests are run at 90 oscillations per minute. On test cars, after 80,000 miles, the bushings are in excellent condition.

A similar test was set up on engine mountings, but, owing to the small amplitude of movement in the car and the enormous factor of safety in the adhesion mountings on our cars, the test ran over 10,000,000 oscillations over a period of two years. At the end of that time the deflection rate had not changed within the limits of reading the instruments and there were no noticeable fatigue signs, so the test was abandoned.

Another interesting test which is conducted along the same lines is the spring-bumper test, in which a hammer is raised and tripped and allowed to drop a given distance, striking on the spring bumper. It is surprising to note the differeence in the effects of this test on the various standard spring-bumper stocks in production by the various rubber companies.

Owing to the fact that in rubber parts it is possible to have the correct hardness, tensile strength and other physical properties and still have a different deflection rate, due to a change in modulus, it is sometimes necessary to specify modulus. This may be done in some cases by specifying a definite limit of deflection rate in pounds per inch of deflection.

same effect as a change in modulus, especially where rubber is bonded to metal. This is due to the fact that, where the rubber is confonide to a fixed volume in curing, the shrinkage of the rubber places it under a tension which will change the build-up rate of the mounting. To avoid this difficulty, clearance is left between the metal parts when in the mold, according to the volume of rubber involved, and, when cooled off, the rubber can be restored to a normal condition by taking up this clearance.

Proportions Between Movements and Volumes

Where rubber is relied upon to give a certain deflection rate, the proportions between amplitude of movement, pounds per square inch of load and volumes of rubber are very important. This problem arises in the designing of engine mountings to have the same deflection rate for engines of different weights. I might point out that I have found it advisable to proportion thickness or volume of rubber almost entirely according to the vibration amplitudes of the engine and the area in tension according to the weight of the engine. Many other factors, such as frame rigidity and engine bounce, enter into this problem, making it impossible to lay down any fixed rules for proportions.

In the case where rubber is confined between two moving parts it is necessary that the volume of rubber be sufficient that, in the elongation of the rubber due to this movement, there should be no localized sections where the stresses exceed the capacity of the particular stock. Also, where the rubber is under compression between moving parts, the volume should be sufficient that deflection be all within the rubber instead of on the surface of contact. In designing rubber parts, such as those in clutch members and vibration dampeners, it should be remembered that rubber is incompressible and, therefore, is adapted only to flow, and where this flow is appreciable it must be remembered that the rubber must stretch, causing fatigue spots or cracks on the body of the rubber, which, in turn, cause abrasion, resulting in heat and destruction.

(To Be Concluded Tomorrow)

CLEVELAND DEALERS AWAIT SHOW OPENING

Cleveland, Jan. 22.—Cleveland's annual automobile show, opening at Public Hall next Saturday, is being looked upon this year as a great civic event, for it is expected to launch an intensive automobile selling period which will help to stimulate general business and thus aid in the relief of unemployment. The show, opening at noon, January 24, will continue through the following seven days.

Approximately 150 models, representing nearly forty makes of cars, will be displayed on the two big floors of the auditorium. In addition to the spectacle which the glistening new cars themselves will provide there will be educational exhibits, a new fashion pageant, musical programs and entertainment.

Herbert Buckman, show manager, is confident that attendance at this year's show will be record-breaking because of undiminished interest, the many improvements to be shown on the new cars and the other attractive features of the great exhibit.

NEW TIRE CONCERN

Buffalo, N. Y., Jan. 22.—A wholesale and retail tire and accessory business will be established in this city by the Georger Tire Company, organized by Merritt N. Baker, Leland G. Davis and Carelton T. Townsend.

WITH THE S. A. E. TODAY AT DETROIT

DIESEL ENGINE SESSION
W. F. Joachim, chairman.

Compression Ignition Engine Research,
E. T. Vincent, Continental Motors Corporation.

A Survey of Mobile Type Diesel Engines,
C. G. A. Rosen, Caterpillar Tractor Company.

Business Session of Diesel Engine Activity.

GENERAL DEVELOPMENT SESSION
E. S. Marks, chairman.

The Use of Zinc and Zinc Alloys in the Automobile Industry,
R. M. Curts, New Jersey Zinc Company.

Riding Qualities,
Dr. Fred A. Moss, George Washington University.

Riding Qualities,
Dr. Ammon Swope, Purdue University.

Business Session of Passenger Car Activity.

GENERAL SESSION
Dr. Miller McClintock, chairman.

Safety Aspects of Car Construction,
Robbins B. Stoeckel, commissioner of motor vehicles for state of Connecticut.

Inspection Trip,
A visit to General Motors proving ground, and to the General Motors Truck Company's plant at Pontiac has been planned for Saturday, January 24.

PACKARD EARNS 60c. PER SHARE IN 1930

Detroit, Jan. 22.—In response to an inquiry about 1930 financial results, Alvan Macauley, president of the Packard Motor Car Company, said:—

"Preliminary figures from our auditors indicate that we have earned in 1930 at least $9,000,000. The company, furthermore, set aside $250,000 each month in 1930 in contingency reserve, part of which was used during the year, but the net balance in the reserve account at the close of 1930 will stand at $2,000,000 or better, against $893,059 at the close of 1929. This indicated increase of $1,106,941 in the reserve account, if added to net earnings, would bring total net profits above $10,000,000.

"Cash and government bonds and other marketable securities as of December 31, 1930, totaled approximately $18,350,000, which will compare with $17,910,561 for similar items on December 31, 1929.

"Inventory position which stood at $13,624,227 at the close of 1929 has been materially reduced but definite figures are not yet available."

Net earnings of $9,000,000 are equal to 60 cents a share, the current dividend rate, on 15,000,000 outstanding shares of stock.

Packard's ability to maintain cash at the 1929 level in spite of lessened earnings and declining sales is pointed to as another item of strength. Cash at close of 1930 was $18,350,000, against $17,910,000 at close of 1929. It is likely that the present dividend of 15 cents a share will be maintained throughout the year. January business to date has been satisfactory.

Major Specifications and Mechanical Details of 1931 Commercial Cars

(Continued from Page 9)

Make and Model	Capacity—Tons or Lbs.	Chassis Price	Engine	No. of Cyl.	Bore and Stroke	Tax H. P.	Max. Brake H. P. Specified R. P. M.	Oil System	Carburetor	Fuel Feed	Ignit. System	Gear Set	Location	No. Spds. For.	Rear Axle	Final Drive	Reduction in Low	Brakes, Foot	Brakes, Hand	Standard Wheel Base	Chassis Weight	Standard Tire Sizes Front	Rear
Studebaker GN-N	4000	1245	Own	6	3⅜x4½	27.3	68@3200	Pb	Str	P	DR	Cla	U	4	Cla	Sp	33.5	4	D	146	3265	30x5	32x6
Studebaker 77	12500	2895	Own	8	3½x4¾	39.2	115@3200	Pb	Str	P	DR	Ful	U	4	Eat	Sp	24.6	4V	D	158	5030	7.00x20	7.00x20D
Studebaker 88	12500	3295	Own	8	3½x4¾	39.2	115@3200	Pb	Str	P	DR	Ful	U	4	Eat	Sp	24.6	4V	D	184	5200	7.50x20	7.50x20D
Studebaker 99	14000	3795	Own	8	3½x4¾	39.2	115@3200	Pb	Str	P	DR	Ful	U	4	Eat	Sp	24.6	4V	D	184	5680	7.50x20	7.50x20D
Whippet 96 A	½	360	Own 96 A	4	3⅛x4¾	15.6	40@3200	Pw	Til	Vac	Aut	Own	U	3	Own	Sp	15.84	4	B	103¼	1665	4.75x19	4.75x19
White 15 B	——	1545	Own GKA	4	3¾x5½	22.5	31@1600	CS	Zen	Vac	L-N	Own	C	4	Own	Sp	18.6	R	R	133½	3402	30x5	30x5
White 160	——	1700	Own GRCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	19.5	4	Tr	138	4025	30x5	30x5
White 161	——	1850	Own GRCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	19.5	4	Tr	138	4290	34x7	34x7
White 60	——	1850	Own 2 A	6	3½x4½	29.4	54@2100	Pw	Zen	Vac	DR	Own	U	3	Own	Sp	17.8	4	Tr	138	3739	30x5	30x5D
White 162	——	1900	Own 6 RCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	19.5	4	Tr	138	4260	30x5	30x5D
White 210	——	2300	Own 6 RCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	23.4	4	Tr	148	4875	30x5	30x5D
White 211	——	2425	Own 6 RCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	23.4	4	Tr	148	5110	32x6	32x6D
White 212	——	2700	Own 6 RCB	4	4 x5¾	25.6	45@1800	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	23.4	4	Tr	148	5230	34x7	34x7D
White 57	——	2725	Own GRC	4	4 x5¾	25.6	45@1600	Pw	Zen	Vac	L-N	Own	U	4	Own	Sp	19.3	R	R	146	3935	32x6	32x6
White 20 A	——	2125	Own GKA	4	3¾x5½	22.5	31@1600	CS	Zen	Vac	L-N	Own	C	4	Own	2R	32.1	R	R	145½	4572	34x5	34x5D
White 61	——	2450	Own 4 A	6	3¾x4½	33.7	61@2100	Pw	Zen	Vac	DR	Own	U	4	Own	Sp	23.4	4	D	148	4789	30x5	30x5D
White 56	——	3125	Own GRC	4	4 x5¾	25.6	45@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	Sp	26.2	R	D	165	5276	36x4S	36x7S
White 51 A	——	3750	Own GRB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	Sp	35.6	R	D	170	6438	36x5S	36x8S
White 51 AT	——	3875	Own 6 RB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	Sp	46.6	R	D	134	6227	36x5S	36x8S
White 58	——	4400	Own GRB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	IG	49.7	D	R	180	1797	36x5S	36x5SD
White 65 K	——	4600	Own 3 A	6	4 x5¼	38.4	72@1800	Pw	Zen	P	DR	Own	U	4	Own	Sp	33.9	4V	D	180	7408	8.25x20B	8.25x20DB
White 55	——	4650	Own GRB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	IG	66.1	D	R	174	8737	36x5S	40x5SD
White 52 T	——	4700	Own GRB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	IG	76.5	D	R	129	8461	36x5S	40x5SD
White 52	——	5100	Own GRB	4	4¼x5¾	28.9	54@1600	Pw	Zen	Vac	Eis	Own	U	4	Own	2R	58.4	D	R	174	9409	36x6S	40x12S
White 59 A	——	6200	Own 3 A	6	4 x5¼	38.4	72@1800	Pw	Zen	P	DR	Own	U	4	Own	Sp	66.5	D	R	155	9775	40x8	40x14S
White 63	——	5000	Own 3 A	6	4 x5¼	38.4	72@1800	Pw	Zen	P	DR	Own	U	4	Own	Sp	41.4	4V	D	168	8350	34x7	34x7D
White 64	——	6300	Own 1 A B	6	4⅜x5¾	45.9	96@1800	Pw	Zen	P	L-N	Own	U	4	Own	2R	46.9	R	D	180	9150	36x8	36x8D
White 63 SW 200	——	6010	Own 3 A	6	4 x5¼	38.4	72@1800	Pw	Zen	P	DR	Own	U	4	Tim	Wo	44.2	4V	—	193	10000	8.25x20B	8.25x20DB
White 64 SW 200	——	7082	Own 1 A B	6	4⅜x5¾	45.9	96@1800	Pw	Zen	P	L-N	Own	U	4	Tim	Wo	45.8	4	—	193	11200	8.25x20B	8.25x20DB
White 64 SW 300	——	7430	Own 1 A B	6	4⅜x5¾	45.9	96@1800	Pw	Zen	P	L-N	Own	U	4	Tim	Wo	56.7	4	—	198	12400	9.00x20B	9.00x20DB
White 50 ASW 400	——	8950	Own 1 A B	6	4⅜x5¾	45.9	96@1800	Pw	Zen	P	L-N	Own	U	4	Tim	Wo	67.1	4	—	204	13200	40x8S	40x8D
Willys Six C-113	½	395	Own C-113	6	3¼x3⅞	25.3	65@3400	Pw	Til	P	Aut	Own	U	3	Own	Sp	13.20	4	B	113	1872	5.00x19	5.00x19
Willys Six C-131	1½	595	Own C-131	6	3¼x3⅞	25.3	65@3400	Pw	Til	P	Aut	W-G	U	4	Cla	Sp	40.8	4	B	131	2625	5.50x20	6.00x32
Willys-Knight T-103	1½	825	Own KGT	6	2⅞x4¾	20.7	55@3000	Pw	Til	Vac	Aut	Cov	U	4	Cla	Sp	42.33	4	B	131	2848	5.50x20	30x5

GENERAL NOTATIONS

***†REFERENCE MARKS** apply to individual lines only and explanations are given under the subdivision for each company in the "SPECIAL NOTATIONS."
CAPACITIES given in this table are in tons or fractions of tons. *Shows maximum allowable gross weight in pounds.
WHEEL BASES given are standard, but optional wheel bases are available in many cases.
ENGINE—Bud, Buda; Con, Continental; Her, Hercules; Kgt, Knight; Lyc, Lycoming; Wak, Waukesha; Wis, Wisconsin; Hall, American Car & Foundry.
LUBRICATION—Pb, pressure lubrication to main and connecting rod bearings; Pw, full pressure lubrication to all main, connecting rod and camshaft bearings, including wrist pins; CS, circulating splash; Sp, splash.
CARBURETOR—Car, Carter; Mar, Marvel; Sch, Wheeler-Schebler; Str, Stromberg; DL, Detroit Lubricator; Til, Tillotson; Zen, Zenith-Detroit.
FUEL FEED—Gra, Gravity; Vac, Vacuum tank; P, Fuel pump.
IGNITION—AB, American-Bosch; Aut, Electric Auto-Lite; Eis, Eisemann; L-N, Leece-Neville; N-E, North East; RB, Robert Bosch; DR, Delco-Remy; Mag, Magneto.
TRANSMISSION—Br, L, Brown-Lipe; Cov, Covert; Ful, Fuller; Mec, Mechanics Machine; Mun, Muncie; W-G, Warner Gear; Cotta Cotta Gear Company; Cla, Clark Equipment Company.
LOCATION—C, center, amid; U, in unit with engine; J, on jackshaft.
REAR AXLE—Cla, Clark Equipment; Col, Columbia; Eat, Eaton; Sal, Salisbury; Tim, Timken; Wis, Wisconsin.
FINAL DRIVE—IG, Internal gear; St, Straight bevel; Sp, Spiral bevel; Wo, Worm; 2R, Double reduction; Ch, Chain; R, Relay drive.
BRAKES—J, Jackshaft; R, Rear wheels; D, Drive shaft; 4, four-wheel; Tr, Transmission; V, Vacuum booster; W, Westinghouse air brake; B, Both front and rear wheels.
TIRES—B, Balloon; D, Dual; S, Solid; P, Pneumatic

SPECIAL NOTATIONS

AMERICAN-LA FRANCE

*Chief model also available as 2½-ton model, 34x7 tire, dual rear, weight 6,400. Price $3,900
Chieftain model also available as Dump Truck, 160-inch wheel base.
Balloon tires optional on Chief, Chieftain and Big Chief models.

AUTOCAR

*Engines in these models are located under the driver's seat.

BROCKWAY

*Six wheelers.

CHEVROLET

Utility model available on 131-inch wheel base with chassis weight of 2,760 pounds and equipped with dual rear wheels.

DAY ELDER

Additional standard wheel bases are available on different models as follows:—

60.....	156	200.....	165, 180, 204
85.....	156, 168	240.....	214
110.....	168, 180	285.....	216
130.....	165, 180, 204	345.....	216
160.....	165, 180, 204	402.....	216

DIAMOND T.

*Six wheelers.

F. W. D.

The BTL and BT models are special line construction trucks in which complete provision for mounting AT and T earth boring machine, winch, body and other line construction accessories is included in the standard chassis.
*Indicates six-wheel model.
Special power take-off transmission, which provides 3 power take-offs which may be operated in any transmission speed, optional on all models.
*Foot brake on X6 is a Bendix type, operating on all six wheels.

FEDERAL

*Six wheelers.

GRAMM

Series	Straight Rating	Add Wheel Base	Pay Load Range
6	10,000	157-174	1¾ tons
B	11,000	145-196	2 tons
C	13,000	145-196	2½ tons
D	13,000	145-196	3 tons
E	15,000	145-196	3 tons

GENERAL MOTORS TRUCK

*Capacity indicated for each chassis is the reccmmended gross weight without exceeding rated capacity of tires. The tire size does not affect the straight rating for which chassis is guaranteed and each model is designed to operate satisfactorily under average conditions with loads giving a total gross weight (chassis, body, equipment and payload) equal to straight rating given below. The additional standard wheel base lengths, the number of additional tire types (tire combinations—each type carrying a recommended gross weight) and the ton range on a nominal payload basis for each model is given below.

Note: Models T-15 to T-60, inclusive, as well as Models TX and WX, are available as coach chassis for export only.

Model	Straight Rating	Additional Wh. bases, ins.			Addit'l Tire Types	Payl'd Range
T-11	3800	None			None	½
T-15	6500	141			9	¾-1¼
T-17	6500	141			6	¾-1¼
T-19	8500	141		151	20	1-2
T-25	9000	141		152	15	1-2
T-30	12500	152		164	13	1½-3
T-42	15000	152	164	181	10	2-4
T-44	16000	152	164	181	10	2-4½
T-60	22000	166¾	184½	200¼	18	2½-6
T-82	24000	167½	185¼	201	10	3-7
T-90	28000	201		220	5	5-7½

Optional rear axle ratios are available for all models. Double reduction axles available for Models T-60 and T-82.

INDIANA

*Six wheelers.

MACK

Other wheel bases furnished on all truck models.
On 6-wheel jobs, 4 rear wheels driven by chains, foot brake on 4 rear wheels.
HYP—Hypoid drive, single reduction.
††Made also in tractor models.

REO

Model F A also available in 129-inch wheel base.

SELDEN

Additional standard wheel bases are available on different models as follows:—

Model 37C.....	162 and 181
39C.....	177 and 190½
47CB, 47CD....	151, 164 and 184
67C.....	151, 164, 184 and 198

STEWART

Models 30 and 30X can also be supplied in 110, 120 and 140-inch wheel base.
Models 40 and 40X can also be supplied in 110, 140 and 160-inch wheel base.
*Model 34X can be supplied in 135, 145, 160 and 176-inch wheel base.
Model 28X can be supplied in 130, 145, 160 and 176-inch wheel base.
Model 29XS can be supplied in 135, 160 and 176-inch wheel base.
*Model 26XW can be supplied in 148, 176 and 190-inch wheel base.
*Models 18X, 32X and 33X can be supplied in 148, 190 and 220-inch wheel base.
*Models 19X, 31X and 27X can be supplied in 148 172, 190, 220 and 235-inch wheel base.
As optional equipment models 18X, 19X, 33X, 31X and 27X can be supplied with Timken dual reduction rear axle.

STUDEBAKER

*Capacity model GN-N is 4,000 pounds for body, cab, driver and payload.
Maximum gross load, chassis, body and payload for Models 77 and 88 is 12,500 lbs. and for Model 99 is 14,000 lbs.
‡Hand brake same as foot brake, standard. Hand brake on drive shaft, special equipment.

Fuel Injection in Otto Cycle Engine

(Continued from Page 6)

a relatively high penetration was used (about seven feet under atmospheric pressure) the engine back-fired and missed and had scarcely enough power to overcome engine friction. The new injection valve, described earlier, was developed to have good atomization but very low penetration.

The effect of injection timing is shown in Fig. 4. For each timing, points corresponding to the performance at a mixture ratio which gave 98 per cent. of the best power are plotted. There seems to be little gain from injecting much earlier than 45 degrees after top center. Thirty degrees after top center was adopted as a standard injection timing for these tests.

Performance curves obtained from the tests with 30 degree injection-timing are shown in Fig. 5, together with the performance curves previously shown, obtained with the carburetor and with injection down the inlet pipe with carburetor removed, for comparison.

The outstanding indication of these curves is the consistent increase in volumetric efficiency with injection into the cylinder. This effect can be fully accounted for by consideration of the decrease in sensible heat content and the corresponding decrease of temperature and pressure of the gases in the cylinder which results from injection of the fuel.

To realize the advantage of this effect it is necessary to inject early in the suction stroke. The graph of volumetric efficiency vs. injection timing, shown in Fig. 4, clearly shows the loss of the effect of temperature and pressure drop and the diminished volumetric efficiency with later injection timing. With injection timing later than 90 degrees after top center, the effect seems entirely lost, and the volumetric efficiency becomes a constant corresponding to best power mixture with inlet pipe injection.

Brake mean effective pressure is increased in the same proportion as the volumetric efficiency, except at lean mixtures, where, in spite of better volumetric efficiency, the power falls below that with injection into the inlet pipe. Since maximum fuel consumption occurs in this range, the best fuel consumption obtained with injection into the cylinder is not as good as the best fuel consumption obtained with injection into the inlet pipe, probably due to imperfect distribution of fuel. Even with very low penetration of the spray, there is a tendency to project the uel at least some distance, so ths , it might well be expected that the mixture of fuel and air in that part of the combustion chamber near the injection valve would be somewhat leaner than the mixture on the opposite end of the combustion space. Since the spark plugs are, like the injection valve, located in the upper part of the cylinder, they also are in the region where the mixture may be leaner than the average mixture in the cylinder. Therefore, when the average mixture ratio in the cylinder approaches the lean limit, the actual mixture near the spark plugs may be so lean as to be outside the range of good combustion, and a considerable loss of power may result.

If this analysis is correct, good turbulence in the cylinder should go a long way toward remedying the trouble. Even under present conditions, injection into the cylinder is in performance superior to carburetor operation.

Tests were made to determine the knocking characteristics of the engine with fuel injection into the cylinder by raising the compression ratio to the point of incipient detonation. The engine was throttled to give the same volumetric efficiency with fuel injection as with the carburetor. Apparently it made little difference to the knocking characteristics whether the fuel was introduced through the carburetor or through the injection valve.

Fuel Oil Injection

No change in set-up was made for fuel oil injection, except to lower the compression ratio to 3.5 to 1, which was the highest useful compression ratio for the fuel oil to avoid detonation. Attempts to operate the engine with fuel oil injected into the inlet pipe were failures, and no tests were made with this injection arrangement. With injection into the cylinder, the operation of the engine on fuel oil was very similar to its operation on gasoline. The performance obtained at such a low compression ratio cannot be compared with the performance obtained with gasoline at higher compression ratios in the tests already discussed. Figure 6 shows the performance obtained with fuel oil and, for comparison, the performance obtained with gasoline at the same compression ratio.

The decrease in volumetric efficiency with use of fuel oil is very marked. This can probably be explained by the consideration that fuel oil, because of its low rate of vaporization as compared with gasoline, corresponds to a late injection of gasoline, in which case the cooling effect of vaporization of the fuel upon the cylinder gases occurs too late to be of much benefit to the volumetric efficiency. This decrease in volumetric efficiency is accompanied by a proportional decrease in brake mean effective pressure. The increase in specific fuel consumption is probably due to poorer vaporization. The fuel consumption with fuel oil becomes less than that with gasoline at mixtures richer than the best power mixture. This may be explained by the fact that fuel oil contains some heavy ends that do not vaporize, so that the effective mixture ratio is somewhat leaner than the apparent one. It may be observed that—for the same reason, apparently—the best power mixture with fuel oil is considerably richer than the best power mixture with gasoline.

It was found in this investigation that, with late injection of gasoline, and especially with fuel-oil injection, there is a distinct advantage in using automobile-type spark plugs having well-exposed points rather than the aeronautic type having the gap within the body of the plug.

It was found possible to start the engine on fuel oil without previous warming up, but considerable trouble was experienced from fouling of the plugs during the warming-up process.

Throttling

All of the tests herein described were run at wide-open throttle, except when a slightly closed throttle was used to reduce the volumetric efficiency with injection to that obtained with the carburetor. In any practical application of fuel injection, it would be necessary to regulate the air throttle and the fuel-quantity control over the useful speed-load range so that the desired mixture ratio would be obtained.

Conclusions

As a brief summary of the results of this investigation, the following conclusions are suggested:

1. High-pressure fuel injection, either into the inlet pipe or into the cylinder, is superior to carburetion in respect to performance. The maximum available power may be increased by 7 to 11 per cent., depending on the method of injection. This increase in power is due partly to the elimination of the pressure drop through the carburetor and partly to direct effects of the spray itself. The improvement in specific fuel consumption may be traced to more even distribution of the fuel between successive cycles and, to a lesser extent, to the higher mechanical efficiency which accompanies the gain in power.

2. The highest useful compression ratios, as fixed by detonation characteristics, are essentially the same with injection of the fuel as with carburetion at the same volumetric efficiency.

3. The best power is obtained with injection of the fuel into the cylinder, and the best fuel consumption is obtained with injection into the inlet pipe against the air stream. It is expected that good turbulence would improve the fuel consumption with injection into the cylinder.

4. Fuel oil can be used as well as gasoline for injection into the cylinder except for the more severe limitations upon useful compression ratio fixed by its detonation characteristics and its tendency to foul the plugs during the warming-up process.

While it is beyond the purpose of this work to investigate thoroughly the mechanical aspect of fuel injection, it may be said that the problems and requirements of the injection system are very similar to those encountered in the corresponding Diesel-engine parts, but they are much simplified by the relative unimportance of exact injection timing and of very accurate rates of injection. Certainly, in view of the fact that Diesel systems have already been built to give very satisfactory service, no particular trouble should be experienced along this line. However, with gasoline injection it is important that lubrication be provided for the pump plunger and that close fits be avoided at sliding surfaces in the injection valve. Otherwise binding and wear will result, with ultimate failure of the parts.

Detonation Symposium Attracts S. A. E. Interest

(Continued from Page 1)

I. P. Morris and De Laverge reading "Combustion Problems and Design of High Speed Lightweight Diesel Engines," and A. A. Lyman, public service co-ordinated transport hanling "Operation and Maintenance of Diesel-engined Motor Coaches."

Yesterday was featured by the first international detonation symposium ever staged and because of its remarkable character aroused the engineers to a high pitch of interest.

"We have passed another milestone on the road to the solution of the problem of detonation or knocking, as it is called, in automobile and airplane engines," declared R. E. Wilson of the Standard Oil Company, chairman of the detonation meeting. "We know how to control most of the variables in engine testing—humidity, temperature, carburetor settings and methods of measuring the sound a knocking engine makes. Ever since Kettering and Midgeley of General Motors first showed, more than a decade ago, that knocking was not pre-ignition, but a separate phenomenon dependent largely on the character of the fuel, and that it limited the compression and hence the efficiency of the automobile engine, automotive and petroleum engineers have been working on the various phases of this problem.

"By the addition of tetra-ethyl-lead as an anti-knock agent and by the development of more intensive cracking methods to give gasolines of high anti-knock value, the problem of producing fuels having this most desirable characteristic has been solved. Of course both of these fuels still cost substantially more to produce than ordinary gasoline, so research in this direction has not ended. A great deal has been accomplished in developing higher compression engines capable of utilizing fuels at full efficiency and without developing a knock even under severe conditions, but this phase of the work also is incomplete."

Mr. Wilson further pointed out that in many ways the most pressing problem confronting the oil and automotive engineers today is the development of a reliable and accurate method of measuring the anti-knock value of a given fuel. This is difficult because in the first place different engines vary, due to variations in compression ratio, size and shape of combustion chambers, efficiency of cooling, the location of spark plugs and exhaust valves. There are hour-to-hour variations in the precise condition of the spark plugs, cooling surfaces and piston rings. Atmospheric temperatures, pressure and humidity also will cause erratic results.

The experts seem to agree that the only satisfactory way to measure the anti-knock value of a gasoline is to compare it with some standard fuel in the same engine within a few minutes of the same time. The S. A. E. has set up a standard scale for comparing fuels. Last year, it adopted a scale based on mixtures of normal heptane, a pure hydrocarbon that knocks badly, and iso-octane, another rare, pure hydrocarbon, which has good anti-knock properties. The percentage of octane in such a blend which just matches the knocking tendency of a given unknown fuel is known as the "octane number" of that fuel.

The still unsolved phase of the problem is the selection of the engine and operating conditions best adapted for a standard method of measuring anti-knock fuel.

Those on the detonation subcommittee working with Chairman Wilson are: T. A. Boyd, General Motors; D. P. Barnard, Standard Oil of Indiana; A. L. Beal, Vacuum Oil; H. K. Cummings and H. C. Dickinson, Bureau of Standards; Graham Edgar, Ethyl; J. Bennett Hill, Atlantic Refining; H. L. Horning, Waukesha Motor; B. R. Jackson, Anglo-Persian Oil Company; Neil MacCoul, Texas Company; C. B. Veal, Society of Automotive Engineers.

Yesterday's detonation meeting presented a series of papers on this subject from the oil and automobile laboratories of the country as part of a co-operative program between the two industries and the Bureau of Standards. Three English engineers made the trip to Detroit to present their findings and take part in this international symposium.

At the same time a transportation session in which the future requirements of motor coach operators were discussed by D. W. Russell of the Southwestern Transportation Company and John B. Walker of the Greyhound line was held.

The motor coach and motor truck session was continued into the afternoon, J. C. Bennett of the Associated Oil Company presenting a similar paper.

In the evening, E. R. Armstrong of the Armstrong Seadrome Development Company discussed with the aid of a large model, numerous charts and motion pictures, the economics of ocean airways, with special reference to the seadrome system. Armstrong's plans contemplate the construction and placement of some eight floating islands located in a direct line from a point midway between Halifax, N. S., and Bermuda, where the first seadrome will be located, and Flores Island in the Azores, thence on a line to Plymouth, England, or Brest, France.

In the discussion which followed C. B. Fritsche, chairman, gave some interesting figures relating to comparative values of dirigible and airplane transportation operation.

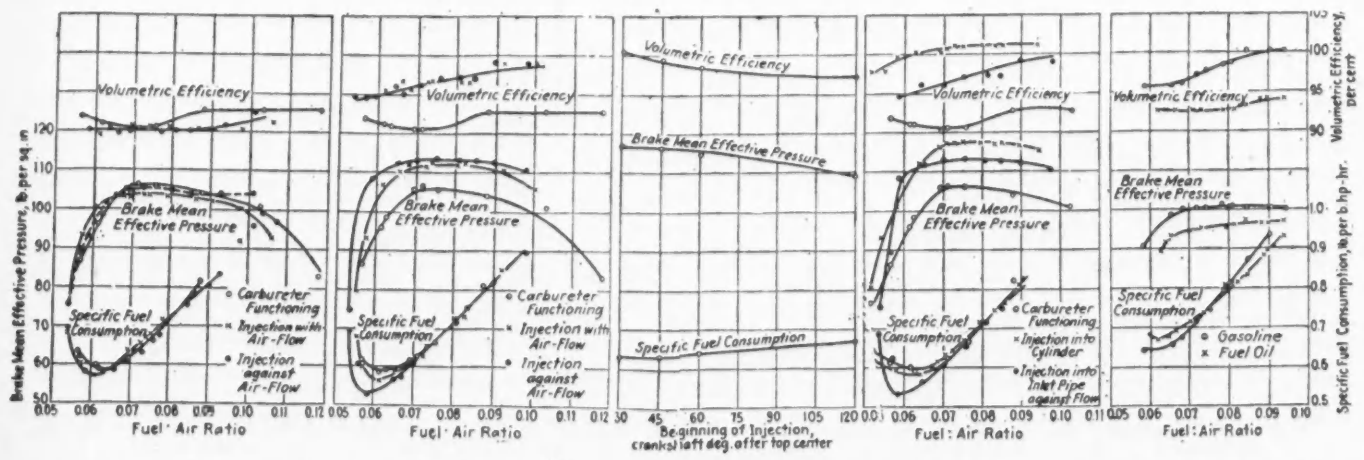
PLAN TO CHANGE N. J. BILL OF SALE LAW

Trenton, N. J., Jan. 22.—As a substitute for the bill of sale act applicable to motor vehicles, Assemblyman Grimm of Essex has introduced a bill designed to expedite registration and permit prosecution of automobile thieves. The measure has the approval of Commissioner Harold G. Hoffman.

The general plan of the Grimm measure is that title paper, in original and duplicate, shall start with a manufacturer or dealer licensed by the department. The duplicate would be given a serial number and filed with the department. Every transfer of title would be treated similarly. Original papers, approved by the department would be retained by the owner and turned over to the person to whom he sells the car.

W. A. NORDSTROM, INC., LEASES NEW QUARTERS

Jamestown, N. Y., Jan. 22.—The firm of W. A. Nordstrom, Inc., wholesale and retail automotive electrical concern and Exide battery distributor, which, for the past eight years, has been located in the building at 12 Fenton Place, has acquired a lease on the former quarters of the Ostendorf Motor Car Corporation in East 3d Street.



Left to right: Fig. 2. Runs with carburetor in place. Fig. 3. Runs with carburetor removed. Reference curves with carburetor functioning. Fig. 4. Effect of timing of the injection into the cylinder. Fig. 5. Curves from injection into cylinder, injection into inlet pipe against air flow and operation with carburetor. Fig. 6. Curves from injection or fuel oil, with gasoline reference curve. Spark advance, 30 degrees

CURVES FROM FUEL INJECTION TESTS

DATA APPLICABLE to all curves, except where otherwise stated, are as follows: Engine speed, 1,500 r. p. m.; compression ratio, 4.3 to 1; spark advance, 28 degrees. Injection begins in suction stroke 30 degrees after top center. Fuel, domestic aviation gasoline. All data reduced to basis of 30-in. mercury barometer and 70 degrees Fahrenheit atmospheric temperature

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